the OIL AND GAS JOURNAL

SYMBOL OF SERVICE

Wherever there's rotary drilling, there's a Hughes representative ready and anxious to be of service to you. His recommendations reflect the Hughes Tool Company "know-how" gained through years of laboratory research and field experience. Anywhere in the U. S. his record of reliable rig delivery assures the right rock bit on your rig at the right time.

Reliable Service is another example of the Hughes determination to provide an "Engineered Solution" for your every drilling problem.

HUGHES
TOOL COMPANY
HOUSTON, TEXAS
WORLD STANDARD OF THE INDUSTRY

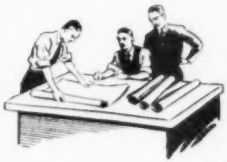
PRICE 50 CENTS TABLE OF CONTENTS PAGE 33 DECEMBER 8, 1949

Greetings

from HALLIBURTON

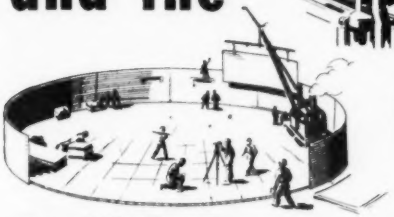
BETHLEHEM

has the Experience



the Engineering Skill

and the Fabricating and



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to Your Complete

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Fabricated Steel Construction

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation • *Export Distributor:* Bethlehem Steel Export Corporation

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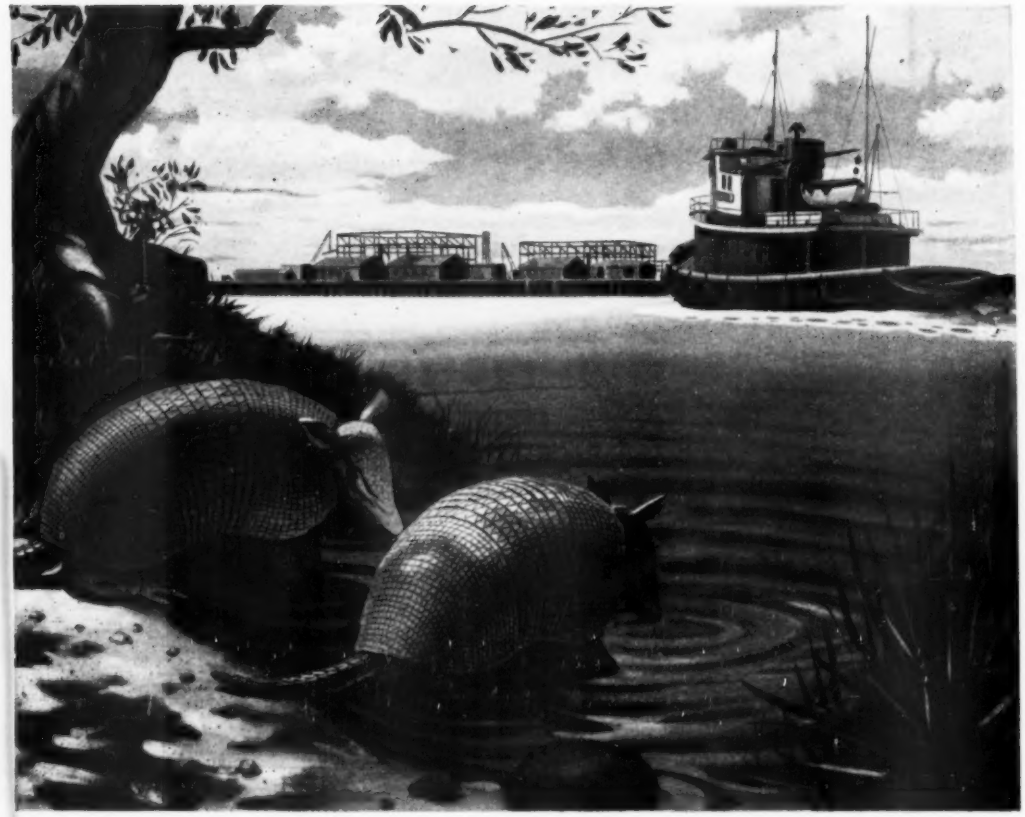

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To the Industrial Developer with Southwestern Plans:

It has been proved many times that the problems confronting industrial construction in the Southwest are unique to the area itself . . . that the solution to these problems is most readily acquired from an organization having complete and accurate knowledge of terrain, soil, climatic and working conditions peculiar to this section.

Brown & Root, Inc., today stands as the foremost construction and engineering concern in the Southwest. Its experience is based on thirty years of successful engineering enterprise.

If you have Southwestern plans, Brown & Root's experience will prove invaluable to you.

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SAVES YOU VALUABLE TIME ON ALL ORDERS AND FORESTALLS TROUBLE IN AN EMERGENCY

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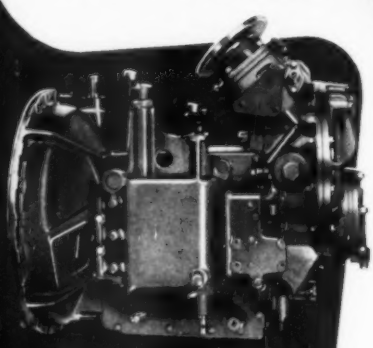

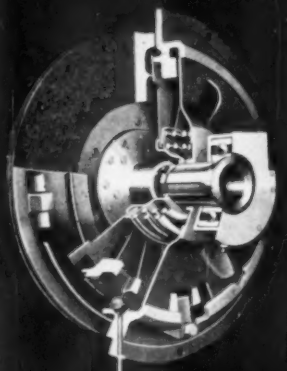

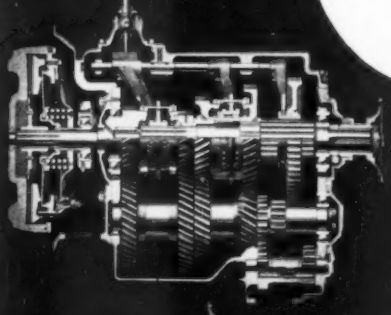

Spicer and Spicer alone...

can assure you this complete range of products from one source

Spicer has progressively BUILT FOR YOU during the past 45 years. BUILT FOR YOU with skill guided by the wisdom of experience. BUILT FOR YOU a range of products covering every need in the automotive power transmission field. BUILT FOR YOU a plant that employs the industry's most advanced production techniques and equipment.

The designing and manufacturing skill gained from producing millions and millions of Spicer units is used by a majority of manufacturers in the truck, bus and passenger car fields. Look to Spicer for assistance that BUILDS FOR YOU . . . all the way from the drawing board through to service in the field.

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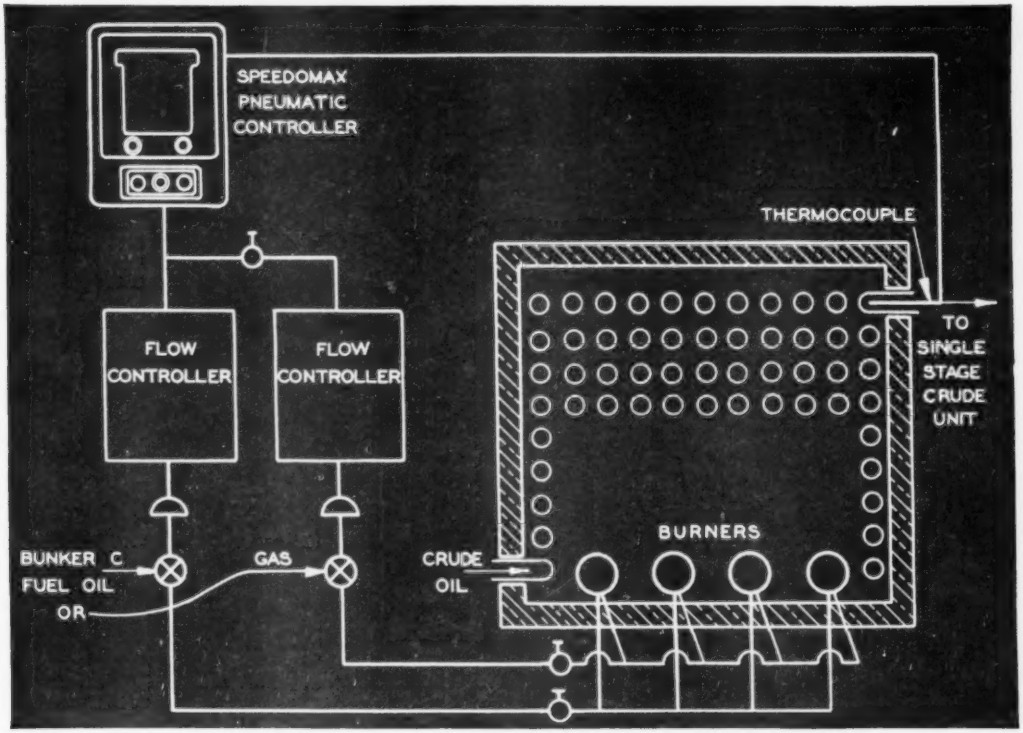

Charging Mixed Stocks? Firing Mixed Fuels?

Get Close Regulation with L&N Complete Control

"We're thinking about shifting the Speedomax Pneumatic Controller to coil-outlet control," remarked the process engineer of a big refinery. "It has been doing a fine job on a tower-top temperature for several months. This outlet is in some ways much tougher. What do you recommend?"

"What's the trouble?" asked the L&N man.

"Well, there's a bad time lag. The stock takes several minutes to go through the furnace, from the fuel valve at the inlet to the outlet, where the thermocouple is located. Also, we burn either gas or oil—whatever fuel we have the most of, so that the fuel quality varies all over the lot."

"Another headache," he continued, "is charging stock. From day to day we charge whatever the tankers bring us. And each stock has its own characteristics, so that we must have different charging pressures and changes in furnace temperature. The whole ball of wax adds up to a real test for any temperature control."

The L&N man nodded. "Fair enough," he said. "Speedomax Pneumatic Control takes the tough jobs right in its stride. The same features of complete control that make it your best buy for your every-day control jobs will handle the toughest ones. That's the beauty of Speedomax Pneumatic—you can move it from any job to any other. You can standardize on it. Try it here and see!"

The result? A new level of efficient performance was reached. Even when charging stock changed—calling for a jump in furnace pressure and coil-outlet temperature—Speedomax brought the furnace right up to the new control point in minimum time and held it there.

For details of the complete pneumatic control which achieves these outstanding results, write Leeds & Northrup Company, 4959 Stenton Avenue, Philadelphia 44, Pa., for Catalog ND4B.

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

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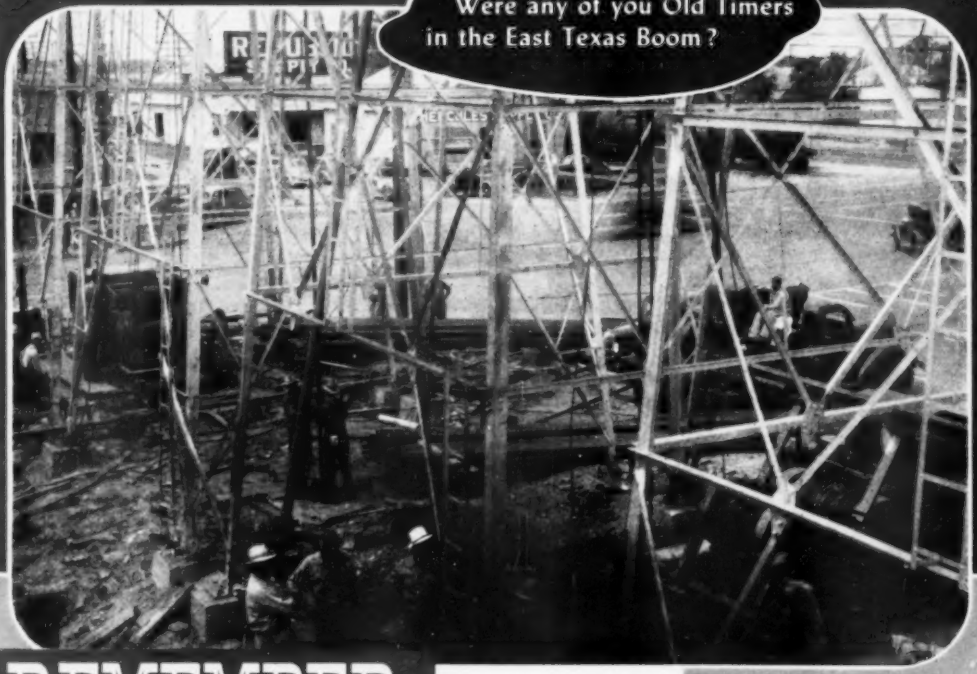
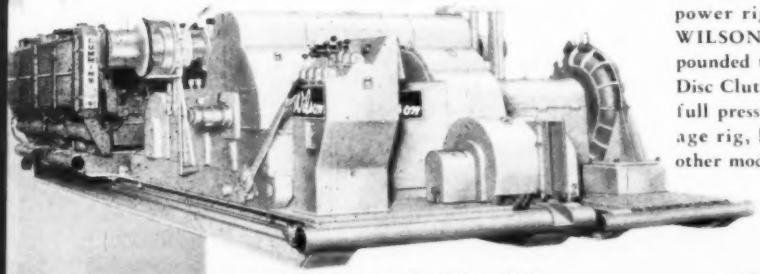


REMEMBER THE CITY WITH THE STEEL SKYLINE . . . KILGORE?

Fabulous Kilgore! Where you could walk across town and stay on the derrick floors . . . Where they tore down the bank building to drill oil wells on the site . . . Where oil once sold for 7½ cents a barrel, and chili was 10 cents a bowl!

. . . . Wilson WAS THERE! AND WILSON WAS FIRST!

The remarkable picture above was taken in 1935 in Kilgore. It shows three adjoining oil wells being brought in, and the work on all three of them is being done with WILSON Winches! There was no question as to WILSON dependability and advance design then . . . and WILSON IS STILL FIRST! The finest power rig ever built is exemplified in the WILSON GIANT TORCAIR RIG. Compounded torque converter drive, Air-Tube Disc Clutches throughout, Air Panel Control, full pressure water cooled brakes, one package rig, less than 12 feet wide, and many other modern features.



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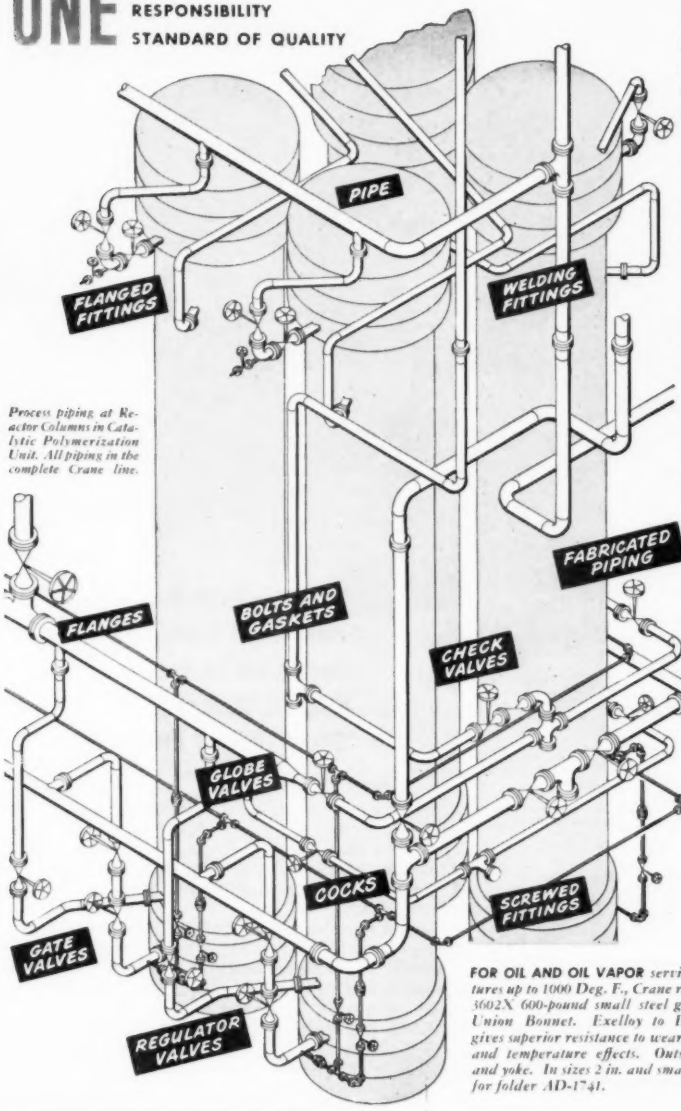

Process piping at Reactor Columns in Catalytic Polymerization Unit. All piping in the complete Crane line.

There's no more advantageous—or logical—source to rely on. Crane offers you the world's most complete selection of quality piping equipment. One order covers whatever you need—valves, fittings, pipe and accessories . . . in brass, iron, steel and alloys. And wherever you are, you're sure of better service through well-stocked cooperating Branches and Wholesalers . . . backed by large factory stocks.

To standardize on Crane gives you more than complete selection plus dependable local distribution. Crane is the **One Source of Supply** comprehensive enough to simplify your piping procedures, from design to erection to maintenance. **One Responsibility** for materials helps to assure better installations, avoids needless delays. **Highest Quality** in every item from Crane makes efficient performance throughout your piping system a foregone conclusion.

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FOR OIL AND OIL VAPOR *services at temperatures up to 1000 Deg. F., Crane recommends No. 3602X 600-pound small steel gate valves with Union Bonnet. Exelloy to Exelloy seating gives superior resistance to wear, corrosion and temperature effects. Outside screw and yoke. In sizes 2 in. and smaller. Send for folder AD-1741.*

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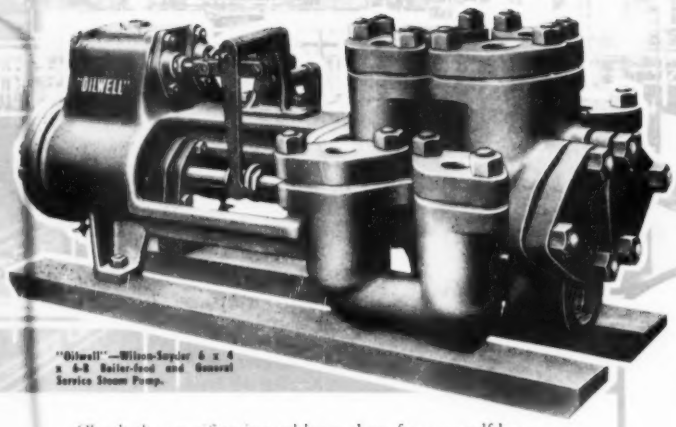
FOR EVERY PIPING SYSTEM

Looking for a Good Boilerfeed or General Service Pump?



"Oilwell"—Wilson-Snyder 6 x 4 x 6-B Boiler-feed and General Service Steam Pump.

"Oilwell"— Wilson-Snyder 6 x 4 x 6-B Boilerfeed and General Service Steam Pumps are available for IMMEDIATE DELIVERY at all "Oilwell" Refinery Warehouse Points.

Check the specification tables and see for yourself how well this pump fits in with your plant requirements . . . then CALL "OILWELL."

BRIEF SPECIFICATIONS

THEORETICAL CAPACITIES IN G.P.M.—PISTON ROD DEDUCTED
(For Actual Capacity, Deduct Slip as shown Below)

Piston Size Inches	Disp. Per Rev Gallons	Displacement (Gallons per Minute) 20 RPM	30 RPM	40 RPM	50 RPM	60 RPM	70 RPM	80 RPM	90 RPM
3	.69	14	21	28	35	41	48	55	62
3½	.95	19	29	38	48	57	67	76	86
4	1.26	25	38	50	63	76	88	101	113
Slip		5%	5%	10%	10%	10%	10%	10%	10%

STALLING PRESSURES — Pounds per square inch

Piston Size Inches	Steam Pressure (Pounds per sq. in.) 100	150	200	250	300	350
3	400	600	800	—	—	—
3½	295	440	590	735	—	—
4	225	340	450	565	675	790

Working pressures are approximately two-thirds of the stalling pressures.

THIS is the kind of boilerfeed and general service pump that can be depended upon for reliable, trouble-free service.

Years of research and application experience have enabled us to design pumps for refinery requirements that are readily accessible for servicing as well as efficient and economical in operation.

And when such expendable parts as (1) fluid-end or steam-end rod packing, (2) fluid pistons (3) liners or (4) valve service must be replaced, you'll find them available at all times at your nearest "Oilwell" Refinery Warehouse.

Contact the "Oilwell" store nearest you for any help you may require in selecting your refinery pumps.

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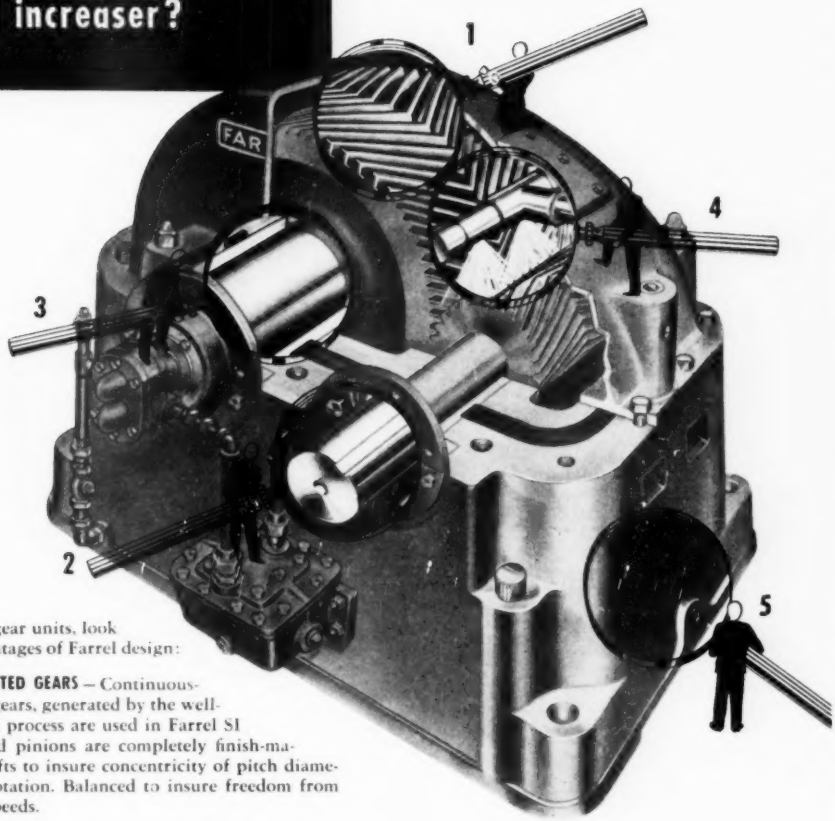
LOS ANGELES, CALIFORNIA

USS "OILWELL"
UNITED STATES STEEL

What do YOU look for in a speed increaser?



Before you specify gear units, look into the many advantages of Farrel design:

1. PRECISION GENERATED GEARS – Continuous-tooth herringbone gears, generated by the well-known Farrel-Sykes process are used in Farrel SI units. All gears and pinions are completely finish-machined on their shafts to insure concentricity of pitch diameters with axes of rotation. Balanced to insure freedom from vibration at high speeds.

2. LARGE, OVERSIZE SHAFTS—You will find these shafts large for the power to be transmitted, giving added stiffness against bending and torsional deflections under peak loading variations. Finish-ground to close accuracy.

3. PRECISION-FINISHED BEARINGS – Split steel shells lined with high-grade babbitt are used. The babbitt is centrifugally poured, resulting in a bonded unit structure. Bearings are finished to same close tolerances held in shafts and other elements.

4. SELF-CONTAINED CIRCULATING OIL SYSTEM—The Farrel system provides pressure lubrication for all bearings and spray lubrication at the mesh line of the gears. A completely self-contained system, integral with the unit. Oil cooler included.

5. HEAVY, RIGID HOUSING – This housing is an exceptionally rigid structure to insure the operating smoothness of the precision-generated gearing.

Farrel speed increasing units are available in 49 standard sizes with speed ratios ranging from 1:1 to 12:1. For higher ratios, units using two sets of gears are supplied with ratio range from 12:1 to 40:1.

For full information, send for new Bulletin No. 448.

FARREL-BIRMINGHAM COMPANY, INC.
344 VULCAN ST., BUFFALO 7, N. Y.

Plants: Ansonia and Derby, Conn.; Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Chicago, Los Angeles.

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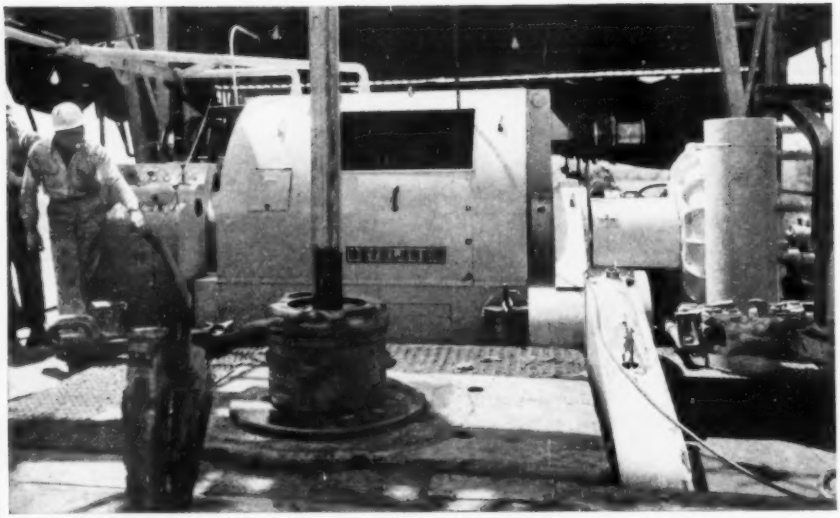
Farrel-Birmingham

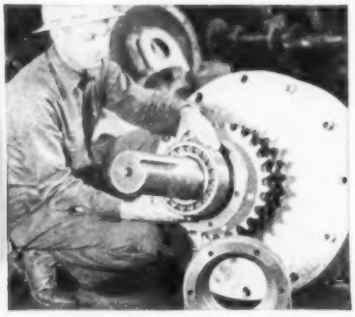
FARREL

FB-479

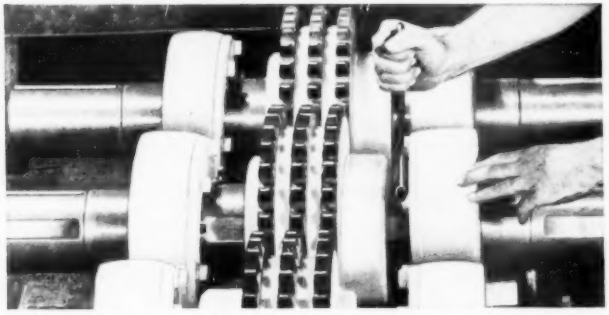
Torrington Spherical Roller Bearings transmit power smoothly in Bethlehem heavy-duty drilling rigs



High-Speed Drilling to depths of 15,000 feet with 4½-inch drill pipe calls for rugged rig construction and smooth, dependable power transmission. So the MC-950 drilling rig, built by Bethlehem Supply Company, incorporates such features as unitized rigid frame construction, massive shafts and heavy-duty, self-aligning Torrington Spherical Roller Bearings.



On the Jackshaft for a two or three-engine compound, two Spherical Roller Bearings handle the heavy loads of the sprocket drive, automatically compensating for shaft deflection.



The Clutch Shaft is another of several applications using Spherical Roller Bearings. Smooth operation of the rig, and reliable transmission of power is assured by the high capacity of these bearings which is maintained despite deflection. The finest bearing steels and precision construction assure long service life.

To secure reliable performance of your heavy-duty oil field equipment, be sure to specify Torrington Spherical Roller Bearings. Our engineers, thoroughly experienced with all types of standard and special anti-friction bearings, will be glad to help you. Write us today. THE TORRINGTON COMPANY, South Bend 21, Ind., or Torrington, Conn. District offices and distributors in principal cities of United States and Canada.

TORRINGTON SPHERICAL ROLLER **BEARINGS**

Spherical Roller · Tapered Roller · Straight Roller · Needle · Ball · Needle Rollers

YOU CAN USE

J&L STEEL *Shot Hole* CASING

It's easy to pull J&L Shot Hole Casing. The average joint pull-out strength is 15,000 lbs. It is made of Controlled Quality steel, electrically welded. Box and pin have coarse, square rolled threads, four per inch.

The fact that so much J&L casing can be recovered and reused indefinitely effects an important economy in any seismograph program.

Easy to handle: Weighs only 2.037 lbs. per foot; 3" dia., 16 gauge; comes in convenient lengths. 4" dia. is also available and is being stocked in some areas.

Your nearby Jones & Laughlin Supply store can fill your orders for 3" from stock, or quickly from the nearest stocking point.

You'll save money with this J&L Shot Hole casing, and you'll enjoy using it. Try it!

JONES & LAUGHLIN SUPPLY COMPANY

Subsidiary of Jones & Laughlin Steel Corporation

TULSA, OKLAHOMA

J&L STEEL

HEAT IMPRISONED

BY K&M "FEATHERWEIGHT" 85% MAGNESIA PIPE INSULATION

The fuel dollars, the power dollars, the production dollars, are what cannot escape at will, where K&M "Featherweight" Insulation imprisons the heat. K&M "Featherweight" cuts, fits and handles without waste effort and material. Maintenance expense is warded off, too, by the high physical strength of "Featherweight" and by its resistance to adverse atmospheric factors.

Modern high-strength lightness in a material with the inherent multi-cellular structure to keep heat in its place, is achieved by the K&M way of correctly compounding clean Asbestos Fibre with basic Carbonate of Magnesia.

Temperatures to 600° F don't overtax K&M 85% Magnesia Insulation. You can get it in all standard dimensions. You'll get assured economies, as with all the other K&M insulation materials. Your K&M Distributor, an insulation expert, is ready with intelligent help for you on any points.

KEASBEY & MATTISON
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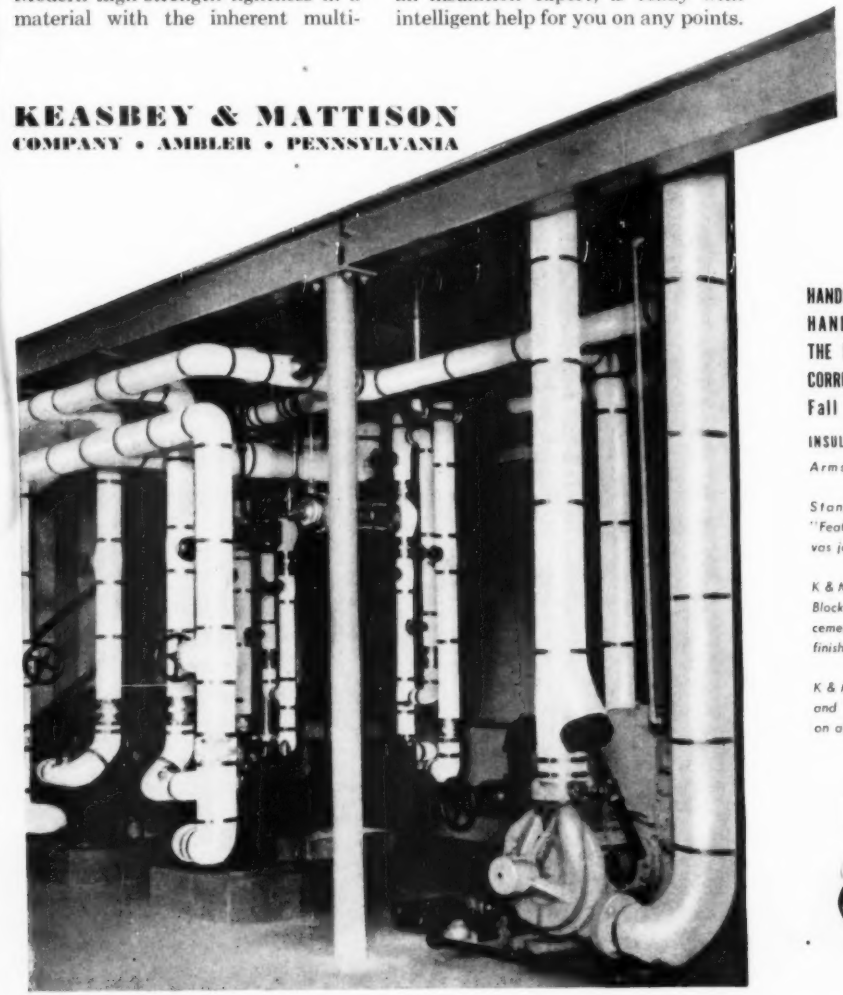


HANDSOME DOES AS HANDSOME IS IN THE PLANT OF J & J CORRUGATED BOX CO., Fall River, Mass.

INSULATION CONTRACTOR: *Armstrong Cork Co.*

Standard thick K & M "Featherweight" with canvas jackets, on all piping.

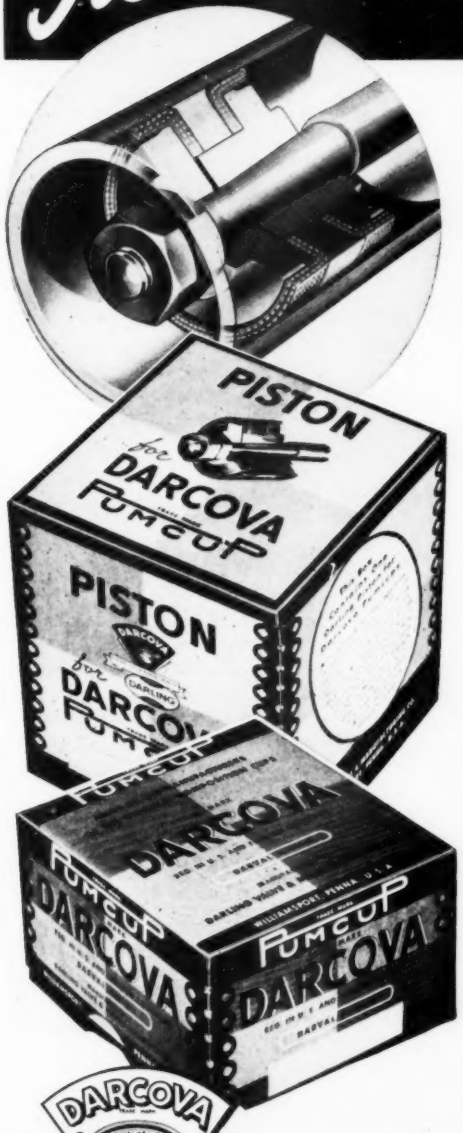
K & M 85% Magnesia Blocks on all flanges, with cement and canvas jacket finish.

K & M Asbestos Cement and canvas jacket finish, on all fittings.

K&M best in asbestos

It's Easy TO CHANGE TO DARCOVA

THE ORIGINAL COMPOSITION CUP



MOST engineers and operators in charge of reciprocating pumps are aware that Darcova Pumcups offer distinct advantages over piston packing of other types—that Pumcups last 5, 10, or even 100 times as long, that fluid slippage is all but eliminated, that efficiency doesn't decrease with Pumcup wear, that pump speed can be reduced and volume increased, that power is saved, and that downtime and maintenance expense are cut to a fraction.

But what many of these men are not aware of is the downright simplicity of changing over to Darcova Pumcups. It's easier than replacing with the old type packing.

To simplify the change-over, to prolong liner and pump life, Darling Pistons are recommended. They are carried in stock at all times, can be supplied in various metals and alloys for every industrial need.

For a free bulletin containing complete information, write, or use the coupon below.

Darling Valve & Mfg. Co., Williamsport 1, Pa.
Please send me the free bulletin checked below:
☐ No. 4401 Darcova Pumcups for reciprocating pumps.
☐ No. 4502 Darcova Pumcups for air or hydraulic mechanisms.

Name_____
Company_____
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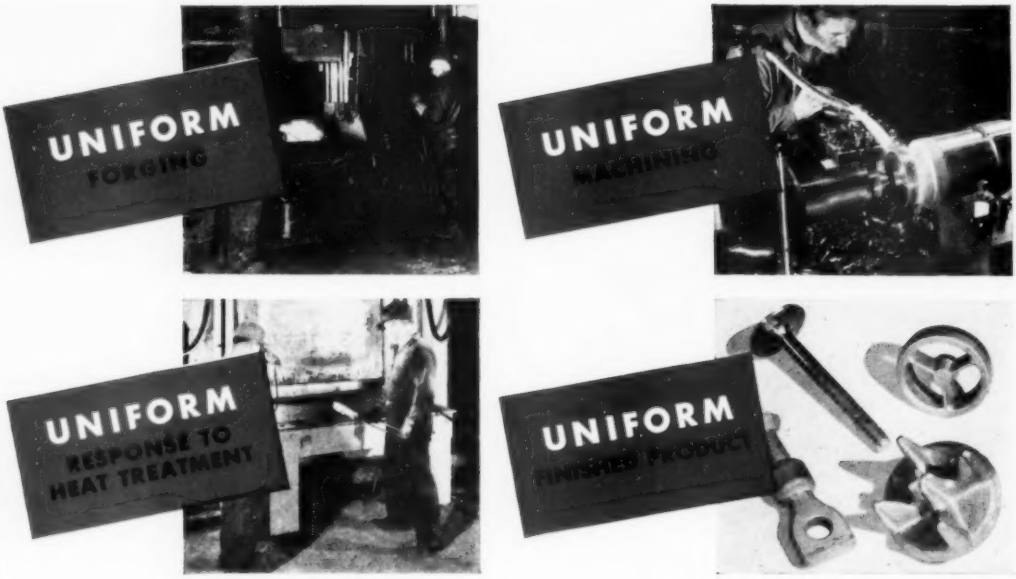
DARCOVA
THE ORIGINAL COMPOSITION CUP

DARLING VALVE & Manufacturing Co.
WILLIAMSPORT, PA.



Uniformity at every step... with TIMKEN® forging steels

YOU get uniformity from start to finish with Timken® forging steels. Their consistently high quality from bar to bar—from heat to heat—assures uniform forgeability, uniform machinability, and uniform response to heat treatment. Results: consistent quality and better performance in your finished forgings. Customer specifications can be met in every shipment, in every piece.

The reliably constant quality of Timken forging steels means lower production costs, too. You get fewer delays, fewer rejects, and shop-practice changes are kept to a minimum.

The uniformity of Timken forging steels is rigidly maintained by the Timken Company's complete quality control from melting through final inspection. Precise control methods, specialized skill, and years of leadership in alloy steel research assure the finest quality in every Timken forging steel.

For help with your problems, write us today. Ask for our 112-page book, "Evaluating the Forgeability of Steels". Address your request to The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

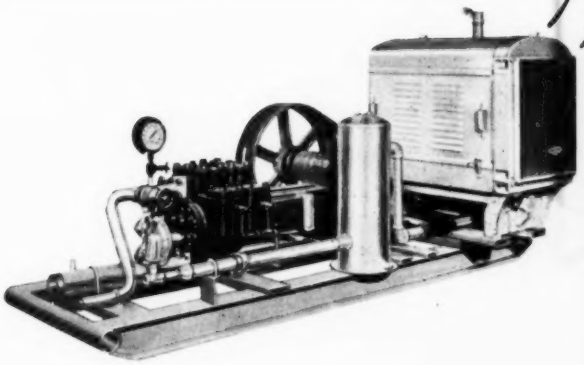
50th birthday of the company whose products you know by the trade-mark: TIMKEN

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool steel types—and alloy and stainless seamless steel tubing.

GASO PUMPS

In tune with the times

New Emphasis on Efficient Operations Throws the Spotlight on GASO PUMPS



The theme song of top management everywhere carries the same refrain: Step up efficiency. Take a new look at methods and equipment. Buy on the basis of value. It's the only way to offset inflated taxes, high costs and intensified competition.

When pumps are selected on the basis of value, GASO gets the call every time. The business of this company is built on the cost records of its customers — realistic records that tell a story of longer life, lower maintenance, less time out for repairs.

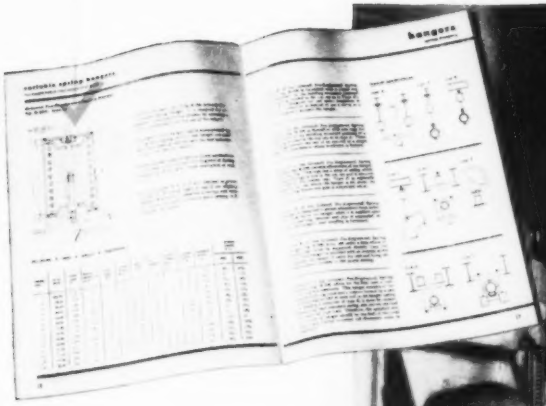
Check up for yourself. Learn why more and more companies are standardizing on GASO PUMPS. Write for latest catalog and full details.

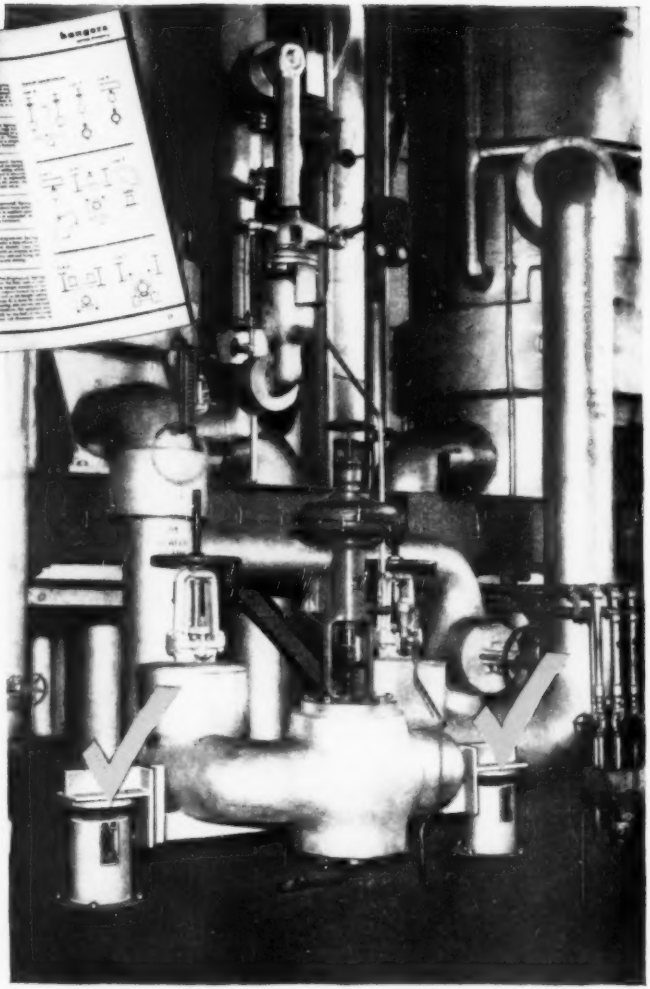
GASO PUMP & BURNER MFG. CO.

TULSA, OKLAHOMA, U. S. A.

Export Office: 149 Broadway, New York. Shreveport and Odessa: W. L. Somner Co.
Los Angeles: Production Equipment Co., Inc. 651 E. Gage Ave.

The problem was "special" but the solution came "out of stock"





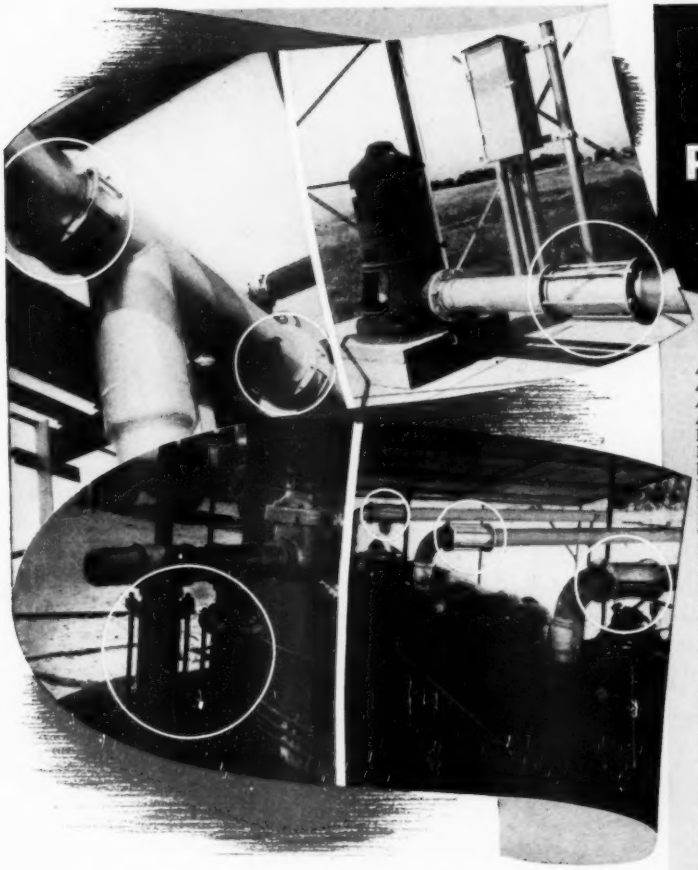
Tons of heater drain piping in the turbine room of the new Southwark station of the Philadelphia Electric Company had to be supported somehow. It had to be flexibly supported because of the travel between its "hot" and "cold" positions. The ceiling was sixty feet up so overhead suspension was out. Could it be supported from the floor? The problem had already been anticipated by Grinnell with their Pre-Engineered Spring Hanger fig. B268: type F. described in the new Grinnell Pipe Hanger Catalog 10D. This hanger is available in 14 sizes with a range of load capacities from 74 to 4800 lbs.

Plenty of other piping support problems are pre-solved economically for you in this combination catalog and manual . . . with ready-to-install hangers and supports . . . all available from conveniently located Grinnell warehouses. Why not write today for your copy of Catalog 10D?

99 YEARS PIPING

GRINNELL

Grinnell Company, Inc., Providence, Rhode Island. Branches: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane



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(Partial List)

Alamo Iron Works
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San Antonio Machine & Supply Co.
Standard Supply & Hardware Co., Inc.
Superior Iron Works & Supply Co., Inc.
United Supply & Mfg. Co.
Weaks Supply Co., Ltd.
Well Machinery & Supply Co., Inc.
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There's nothing handier

THAN A DRESSER

Available through your favorite supply store, Dresser Couplings and Long Sleeves are handy to use in a thousand places. They make quick, dependable connections on gathering lines, water lines, mud lines, Christmas trees, tank connections, equipment hookups, valve settings. Save time, save money, save headaches—use Dressers.

DRESSER COUPLINGS and Repair Products

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FREE literature to help you CUT cleaning costs

1 Descaling Heat Exchangers

2 Cleaning Towers

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5 Paint Stripping Storage Tanks

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Complete Coverage on Maintenance Cleaning

HERE'S useful information about the many maintenance cleaning jobs you can do faster at less cost—with Oakite cleaning and descaling materials and methods.

The 32-page booklet, at top, is full of practical down-to-earth facts on the general cleaning of production equipment (drilling rigs, Diesels, mud hogs); and refining equipment (heat exchangers, towers); and marketing equipment (drums, pumps, trucks).

The six folders represent those cleaning jobs most frequently encountered in the petroleum industry. Each job is discussed individually in detail . . . aided by photographs and diagrams.

This literature is freely available to you as is Oakite Technical Advisory Service. You can obtain both simply by writing address below today. No obligation.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

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MATERIALS • METHODS • SERVICE

OAKITE PRODUCTS, INC., 44C Thames St., N. Y. 6, N. Y.

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VESSEL DIVISION

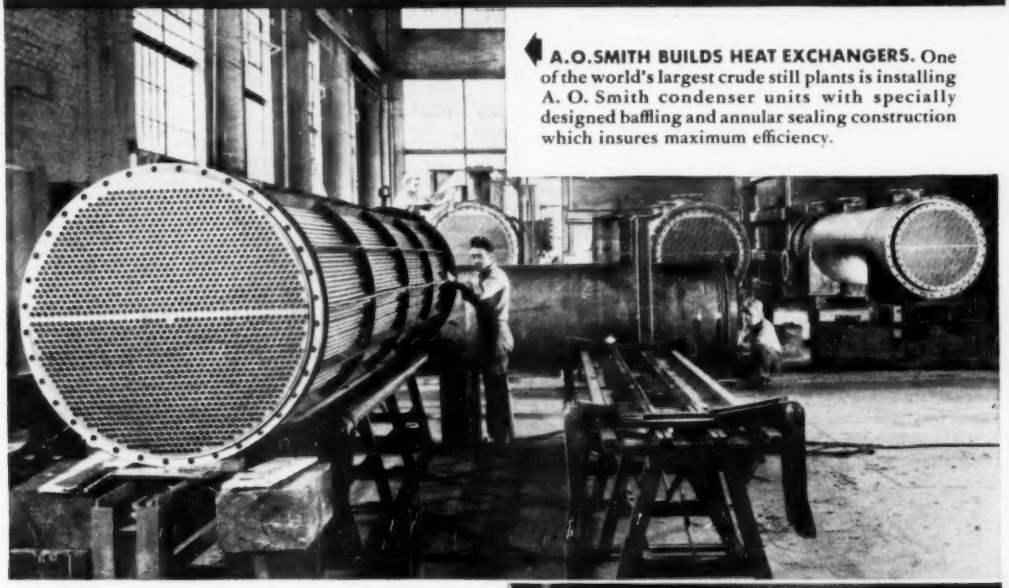
NEWS

A.O. Smith 75th ANNIVERSARY 1874 - 1949

A.O.Smith

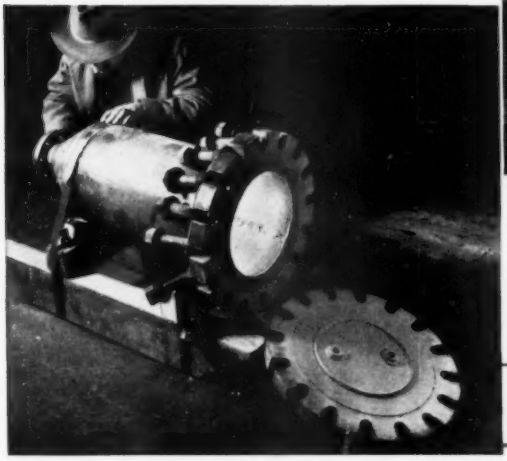
CORPORATION

New York 17 • Philadelphia 3 • Pittsburgh 19 • Atlanta 3 • Chicago 4
Tulsa 3 • Dallas 1 • Houston 2 • Seattle 1 • Los Angeles 14
International Division: Milwaukee 1



A.O.SMITH BUILDS HEAT EXCHANGERS. One of the world's largest crude still plants is installing A. O. Smith condenser units with specially designed baffling and annular sealing construction which insures maximum efficiency.

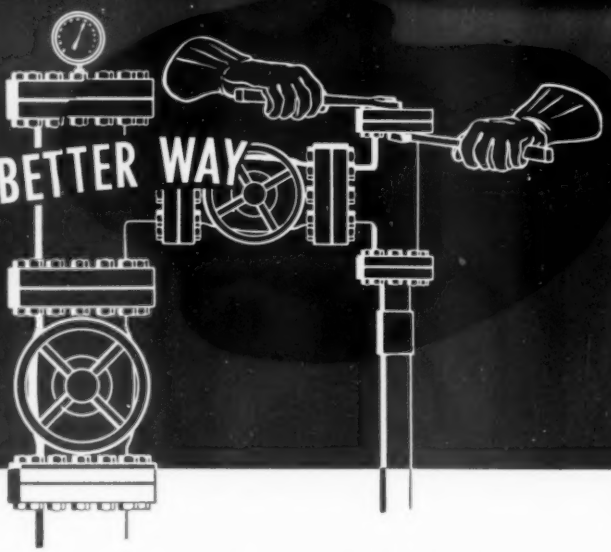
NO PIG-IN-A-POKE HERE. The customer and A. O. Smith collaborated in the building of this SMITHway alloy-lined experimental pilot unit so that the alloy lining, selected by laboratory tests for corrosion service, could be subjected to process test-runs before the full-size production units were manufactured.



SAFEGUARDING THE CUSTOMER'S INVESTMENT. After the selection of the alloy lining, A. O. Smith makes doubly sure that it conforms to specifications, and does not contain any undesirable residual elements, by spectro-chemically analyzing sample coupons of the lining before releasing it for manufacture into the vessel.

VESSEL BULLETINS. Write the nearest A. O. Smith office listed above for Bulletin V-46, SMITHway Vessels, Alloy, Alloy-Lined, Clad, and Glass-Lined; Bulletin V-44, Field Assembly of Pressure Vessels.

UNIBOLT PROVIDES A BETTER WAY TO DO THIS JOB!



UNIBOLT TEE OR CROSS WITH BLANKING PLUG—available in any desired combination of inlet and outlet sizes and pressures.

UNIBOLT POSITIVE CHOKE—release only one bolt to change chokes in this regular UNIBOLT Choke Body fitted with UNIBOLT Flow-Rated positive bean and Blanking Plug.

UNIBOLT ADJUSTABLE WING VALVE—can be assembled in manifold for flowing with or against the stem. Provides economical wing valve, with unrestricted flow, for shut-off while changing beans.

Employing standard UNIBOLT connections rather than flanges, the UNIBOLT Manifold is many pounds lighter, yet the unique UNIBOLT design, which places more steel in shear, actually results in a higher factor of safety for the manifold.

Here are other reasons why more and more operators are specifying UNIBOLT Flow Manifolds as a better means of controlling well flow: (1) Units of the manifold . . . Unibolt Adjustable Wing Valve, Unibolt Positive Choke Body, and Unibolt Tee or Cross . . . are pressure-tested as a unit and may be assembled in a number of combinations to best meet individual requirements; (2) Any desired volume of well flow may be accurately achieved with UNIBOLT Flow-Rated Beans, which are available in flow increments of 5% and 10%, or in standard fractionally drilled sizes; (3) Lower first cost and maintenance; (4) All parts may be safely and easily replaced in the field; (5) Its units are completely interchangeable; (6) The manifold is completely salvageable; (7) It is available in regular forged steel or in high-chrome alloy for corrosive wells—6000 lbs., 10,000 lbs. and 15,000 lbs. test.

UNIBOLT

Time-Savers in Oil Fields Everywhere

High-speed performance in handling digging and grading jobs has consistently proved that Bucyrus-Eries save valuable time in oil fields throughout the United States. A big reason is that these machines are specially designed to make use of all the tractor's power, getting out the extra punch that means speedy progress, more money savings for you!

BUCYRUS ERIE Bullgraders and Bulldozers

Ask owners about Bucyrus-Erie field performance; then see your International Industrial tractor distributor for further details. You'll find it pays to use fast-working Bucyrus-Eries wherever there's dirt to move.

172T49

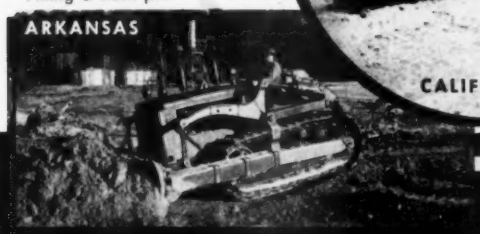
Cutting location for a gas well.

Digging a reserve pit.

Backfilling over 20" crude oil pipe line.

Filling a slush pit.

Grading an oil well location.



Leveling a new oil field road.

Bucyrus-Erie Company
South Milwaukee, Wisconsin

See Your INTERNATIONAL Industrial Tractor Distributor

The KAYDON *technique of deep-flame-hardening for bearings of unusual shapes, sizes and thin sections*

Designers and users of special machinery will appreciate this information on **KAYDON**-pioneered deep-flame-hardening which has helped remove bearing-limitations that heretofore proved to be serious handicaps.

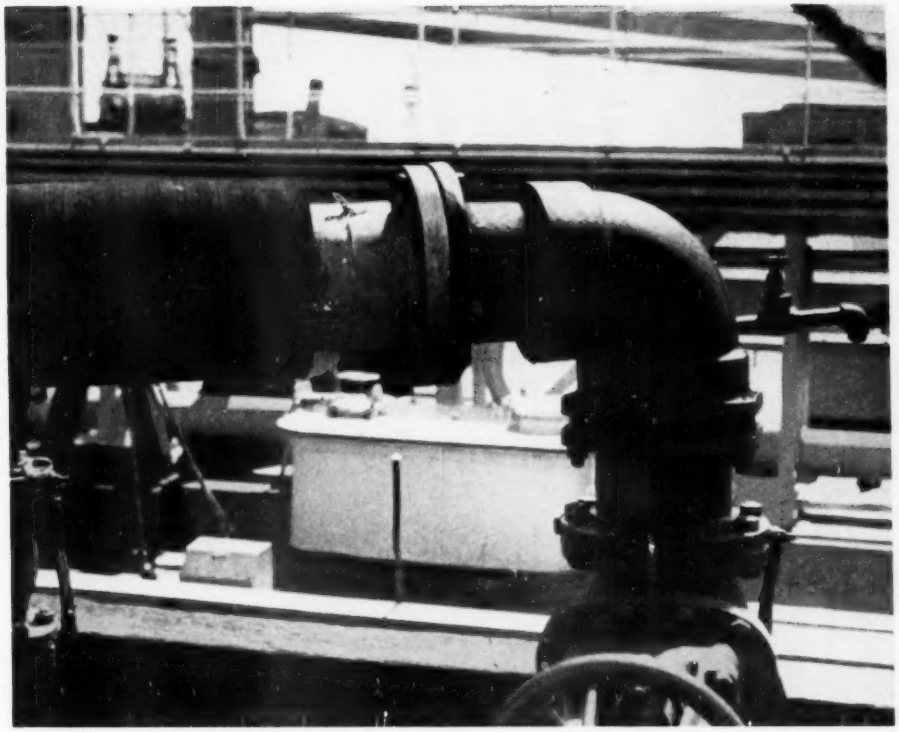
This new **KAYDON** technique in deep-flame-hardening hardens only the raceways of the bearings. This permits the races themselves to be accurately drilled, tapped and gear-cut . . . eliminates many of the surrounding parts which normally would be necessary . . . results in important weight-reduction . . . makes possible the creation of unusual designs that accommodate minimum sizes of bearings in the space available . . . permits unusual shapes, very large diameters, and extremely thin sections, all of which greatly facilitate mounting.

Write for this Bulletin on **KAYDON** Deep-Flame-Hardening . . . and when you need the unique services offered, contact **KAYDON** of Muskegon.

KAYDON Types of Standard or Special Bearings: Spherical Roller • Taper Roller • Ball Radial • Ball Thrust • Roller Radial • Roller Thrust

THE KAYDON ENGINEERING CORP., MUSKEGON, MICH.

• ALL TYPES OF BALL AND ROLLER BEARINGS 4" BORE TO 120" OUTSIDE DIAMETER •



making the hose that feeds the tanker . . .

is a job best done by Republic Rubber

THROUGH the smooth bore of Republic's Dock Loading Hose slide millions of barrels of petroleum going in and out of the ships that carry it to distribution points all over the world.

Shown above is a section of Champion Smooth Bore Dock Loading Hose with a built-in aluminum nipple. This combination is light, easy to handle; it's safe, and it's tough for both high pressure and suction pumping.

The hose has a special Reprene oil-resisting cover, specially compounded to resist abrasion from concrete docks and the sides of vessels. And it won't crack or craze under the sunlight!

The corrosion-resistant aluminum nipple is vulcanized into the hose, eliminating the use of any external bands or clamps which might interfere with easy handling. The aluminum is light and strong, and it will never cause dangerous sparks. Explosions are further prevented by a special ground wire that runs the entire length of the hose.

Republic Rubber has been serving the Oil and Gas Industry for more than 48 years.

Republic Rubber is *the* specialist in mechanical rubber goods. Consult your distributor today or write Republic Rubber for specific information.

Pioneers in the use of COLD RUBBER

REPUBLIC RUBBER DIVISION

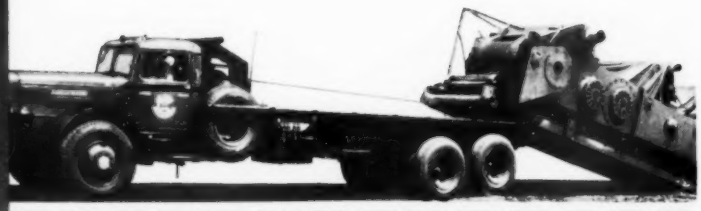
LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN, OHIO

Lee Deluxe Tires & Tubes · · Conshohocken, Pa.

MECHANICAL RUBBER GOODS BY

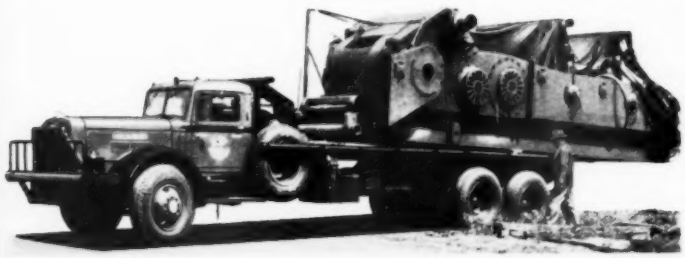
REPUBLIC RUBBER DIVISION

OIL-FIELD HAULERS



RELY ON AUTOCAR

POWER AND STAMINA



These action pictures show how J. E. Cox, oil-field hauler of Breckenridge, Texas, winches a drilling rig from the ground level up over rollers onto the body of his Autocar-Diesel six-wheeler — an operation that is unavoidable in the oil regions but is not endorsed by automotive engineers for general application.

AUTOCAR TRUCKS

They cost less, because they do more work

THE AUTOCAR COMPANY, ARDMORE, PA. • ESTABLISHED 1897
FACTORY BRANCHES AND DISTRIBUTORS FROM COAST TO COAST

FIRST CHOICE

for *fast* installation....

ELECTRUNITE

Heat Exchanger Tubes

Next time you're faced with the problem of getting "off steam" units back into operation in a hurry, remember the name, ELECTRUNITE—the *original* electric resistance welded pressure tube.

These modern tubes go in *FAST* because they are *uniform* in diameter, *uniform* in wall thickness and *uniform* in concentricity—throughout every length and every shipment. They slide through tube sheets freely, roller expand smoothly and bead over into tight, non-leaking joints without difficulty. Uniformly high ductility and freedom from trouble-causing hard spots are assured by Republic's *full normalizing* process.

Actual tests have proved that ELECTRUNITE Pressure Tubes cut installation time by as much as 30%. For complete information about these time-proved tubes that go in faster and last longer than ordinary tubes, write today to:

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Dept.: Chrysler Bldg., New York 17, N.Y.

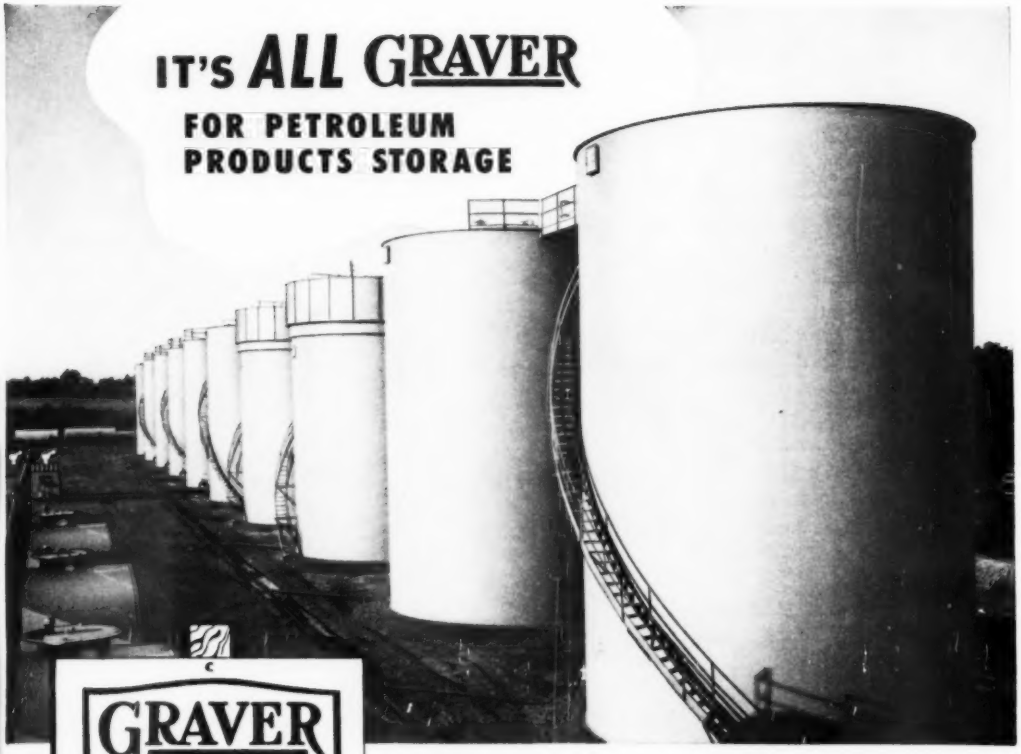
REPUBLIC STEEL

Republic ELECTRUNITE

BOILER, CONDENSER AND HEAT EXCHANGER TUBES

IT'S *ALL* GRAVER

FOR PETROLEUM PRODUCTS STORAGE



Manifolding the vapor spaces of several cone roof tanks to the vapor space of the Expansion Roof Tank forms a closed system and prevents breathing and filling losses throughout the entire battery. The record of savings with this system is open for your inspection.

• Supplying dealer outlets over a 40-mile radius . . . this major oil company terminal is typical of Graver installations from coast to coast.

At this location are ten 33 x 48-foot tanks fabricated and erected by Graver — five cone roof tanks for kerosene and fuel oil and three cone roof tanks interconnected with two Expansion Roof Tanks for vapor saving gasoline storage.

With the emphasis on conservation it is imperative to recognize the value of the Graver Expansion Roof in preventing evaporation losses. It is likewise important to rely on Graver experience and facilities in the purchase of steel storage tanks for gasoline, kerosene, or fuel oil—whether it be field erected cone roof tanks or shop built bulk tanks. In any event . . . for any storage requirement . . . get in touch with Graver.

GRAVER

FABRICATED PLATE DIVISION

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA

NEW YORK • PHILADELPHIA • CHICAGO • CATASAUQUA, PA. • HOUSTON • SAND SPRINGS, OKLA.

They Say—

Point Four

"The conclusion is inescapable that only private capital can give adequate and satisfactory financial implementation to the Point Four program. Such capital is available in large amounts, but only on condition that investors can be offered much stronger prospects of safety and profit in foreign countries than exist at present. This is primarily a problem to be solved by the foreign countries themselves, although our own Government can help by continuing and intensifying its efforts to remove trade barriers, by negotiating bilateral agreements to correct the conditions and practices that now prevent large-scale foreign investment, and by examining its own tax rates and security regulations that tend to discourage capital, especially equity capital. The Department of State has announced that Congress will be asked to liberalize taxes on income earned in foreign countries."

The Guaranty Survey, Guaranty Trust Co. of New York.

Taxes vs. Profits

"A group of the country's 100 largest retail trade corporations, based upon volume of sales reported for the 1948 calendar or nearest fiscal year, shows a combined total of sales exceeding $19 billion. . . .

"Federal income tax liability of this group for 1948 totaled $431 million, which represented an average of 2.3 cents out of every sales dollar. Total direct taxes—federal, state, local, and foreign, but excluding sales taxes collected from customers—according to complete tax details reported by companies having over four-fifths of the total net income, may be estimated for the entire group at approximately $625 million. This represented an average of about 3.2 cents per sales dollar, or $21,300 per store, or $546 per employe. It is more than twice as large as the dividends, totaling $298 million, paid to shareholders."

Monthly Letter, National City Bank of New York.

Greater Mileage

"Probably the strangest automobile 'race' in the world is that which is sponsored every summer by an oil company.

"Startling results, such as 85 miles to a gallon of gasoline, are achieved in an ordinary family car. No special gadgets or attachments are permitted, and the scientist-drivers use regular service-station gasoline.

"The secret of their success is that they tune up engines to watchlike precision, reduce every point of friction, and carefully plot out their strategy in advance—where to accelerate or coast, and where to switch engines off and on.

"Although the average motorist can never hope to achieve such sensational results, the race emphasizes the fact that any driver can improve his mileage by proper lubrication and driving at reasonable speeds."

The Associated Press.

Less Horsepower

"Is it desirable to increase automotive horsepower if by doing so we increase gasoline consumption? We are consuming petroleum at a rate of about 5,000,000 bbl. a day in the United States.

"Certainly any means that can be found whereby we can prevent the increased rate of consumption from getting out of hand would be valuable from a conservation standpoint."

James Boyd, director, U. S. Bureau of Mines, addressing Washington Society of Engineers.

Employes' Responsibility

"Our responsibility as employes is clear: to give a fair day's work, with a minimum of waste, in producing our products at a cost which will enable our company to meet its com-

Oil fields tough?

So are Gilmer Multiple V-Belts!

A finer phrase for *V-belt guts* is *Gilmer Rayon Pulling Cords*—inherently strong—inherently low in friction—inherently cool-running—and then "normalized" the Gilmer way to give you matched multiples that stay matched.

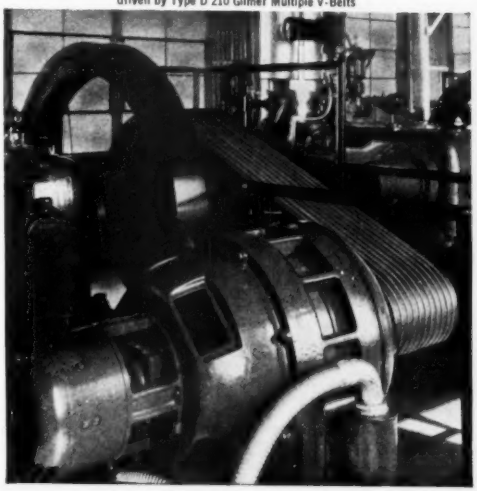
With load per cord equalized, and with cords positively, separately cushioned, you get every safeguard against belt deformation. That keeps tough-jacketed, straight-sided Gilmer V-Belts snug to the sheaves—running and slacking off smoothly—saving power, belt replacements, downtime and your money.

L. H. GILMER COMPANY

Tacony, Philadelphia 35, Pa. Division of United States Rubber Company

Gilmer BELTS **BUY THROUGH YOUR GILMER DISTRIBUTOR**

In a gas booster station, this generator is driven by Type D 210 Gilmer Multiple V-Belts



***Gilmer* has the PULL**

Specially conditioned **Gilmer Multiple V-Belts are made for extreme oil conditions, heat, static, and moisture.**

The "2-in-1" belt is Gilmer Kable-Kord—the Contactor-Power Flat Belt. Other Gilmer Flat Belts—cut edge or endless continuous cord—will put the brakes on stretch for you.

Whatever your power belt problem, ask for the help of Gilmer Engineers.

V-BELTS FLAT BELTS
HOSE PACKING
WIRE TAPE

petitors on even ground. Only by earning profits can our company give its stockholders a fair return for their investment and buy the tools with which we work."

The Esso Refiner, Esso Standard Oil Co.

Low Turnover

Oil company employes' work is steadier and their wages higher than that of workers in the average American industry. In almost every case vacations, disability benefits, and retirement pay are provided. Government figures show that less than one out of every hundred oil refinery employes left their jobs voluntarily or otherwise during 1948, while the average separation rate for all manufacturing concerns was 4.5 employes for every 100.

The Sohio News, Standard Oil Co. of Ohio.

Trading Problem

"It is highly probable that Canada will be seriously concerned with a U. S. dollar problem for some years to come. However, there are certain longer-range tendencies which in time will help to ease this problem. Though Canadian exports to the United States will vary with business conditions, the U. S. economy is still growing and some of its natural resources are becoming increasingly deficient in relation to its consumption.

"There is a gradual and long-established tendency for the basic products of Canada to go to the U. S. market in increasingly processed forms—from pulpwood to woodpulp to newsprint, from ore to concentrates to refined metals. This trend has always been retarded by the structure of the U. S. tariff and could be much facilitated by appropriate reductions today. So far as imports are concerned, the trend seems to be in the direction of lessened, though still great, dependence on the United States. Canadian industry is today somewhat less dependent on imported components and parts than before the war and the oil discoveries in Alberta promise a steady and perhaps quite rapid reduction in net imports of petroleum."

Monthly Review, Bank of Nova Scotia.

Engine Contaminant

"The air in an average city deposits over 100 tons of dust per square mile monthly and the average car breathes 6,000 cu. ft. of this air every mile it runs. An air filter to remove that dust would have to be bigger than the engine."

Refinery News, Tide Water Associated Oil Co.

No Middle-Aged Cars

"In spite of record output of new cars since the war, U. S. now has nearly three times as many cars over 10 years old as in 1941.

"By year-end, about 35.7 million passenger cars will be in use in the nation. That is about 6.1 million more than in 1941.

"About 14 million of the cars in use this year will be postwar models, less than 4 years old. In 1941, 12 million cars were less than 4 years old.

"But another 14 million cars today are over 10 years old, where in 1941 only 5 million cars had been in use for more than a decade. . . .

"The average age of all passenger cars in U. S. was 5½ years in 1941. It reached 9 years by 1946, and now is down to 8.4 years."

Automobile Facts, Automobile Manufacturers Association.

Globe Circlers

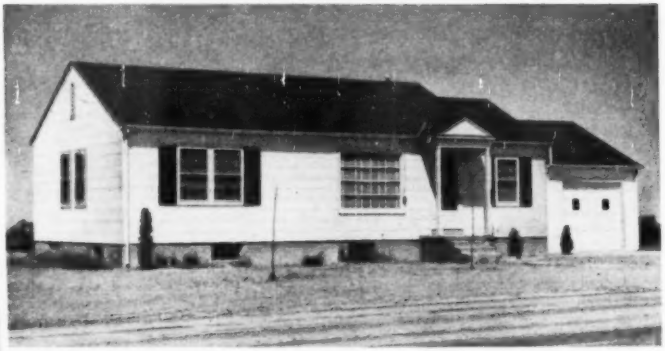
"Criss-crossing the nation and working 24 hours a day to keep America supplied with petroleum products are more than 425,000 miles of pipe line—enough to circle the globe at the equator 17 times.

"Of the vast mileage, 150,000 miles represent crude oil and products, and 279,000 miles are gas (natural, mixed, and liquid petroleum). Natural gas has by far the most extensive mileage, 259,400 miles of pipe line."

The Odessa American, Odessa, Tex.

For 30 Years

OIL FIELD HOMES *of Distinction*



PREFABRICATED 30 Years HOME MANUFACTURER

MANUFACTURERS OF SPECIAL MILLWORK; DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS; CURTIS WOODWORK

STURDYBILT Prefabricated Homes brought oil field housing out of the "shack" class. Now, workers live in modern, comfortable STURDYBILT Homes in even the most isolated oil fields. Modernize your oil field camps with durable STURDYBILT Prefabricated homes.

STURDYBILT

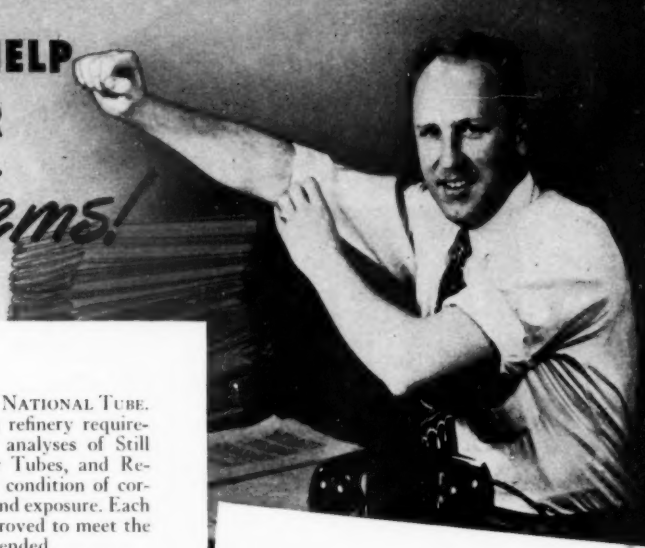
SOUTHERN MILL & MANUFACTURING CO.
Tulsa, Oklahoma

Prefabricated, Demountable Houses

phmi

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125-45 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

WE'RE READY TO HELP YOU LICK YOUR *Tubing Problems!*



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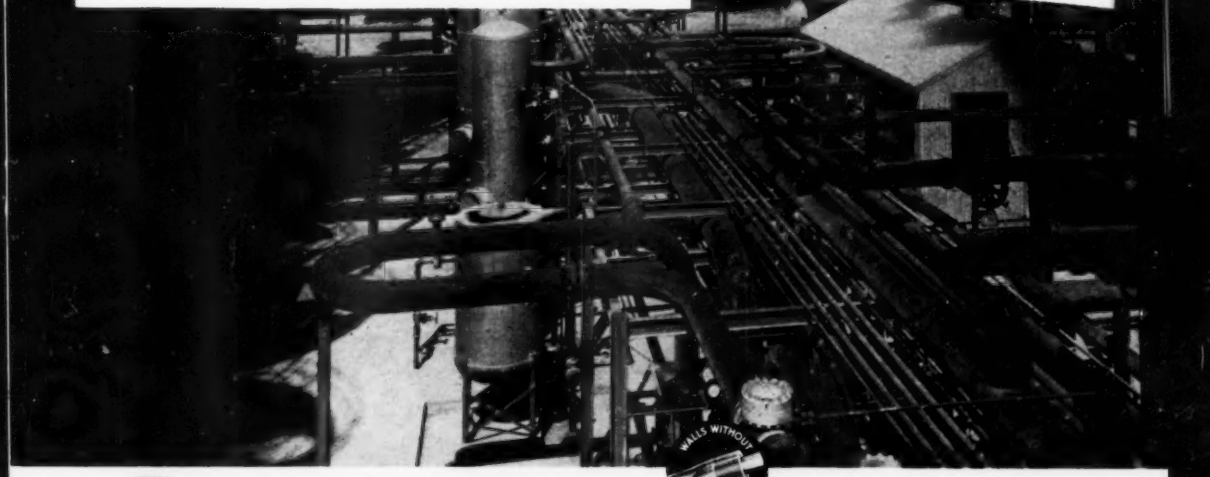
- 1 Cr., ½ Moly.
- 1¼ Cr., ½ Moly.
- 2 Cr., ½ Moly.
- 2 Cr., ½ Moly., 1¼ Sil.
- 2¼ Cr., 1 Moly.
- 2½ Cr., ½ Moly., ¾ Sil.
- 3-Cr., ½ Moly., 1¼ Sil.
- 3-Cr., 1 Moly.
- 5-Cr., ½ Moly.
- 5-Cr., ½ Moly., 1½ Sil.
- 5 Cr., ½ Moly., Titanium
- 7 Cr., ½ Moly.
- 8 Cr., ½ Moly.
- 8 Cr., 1 Moly.
- 9 Cr., ½ Moly.
- 9 Cr., 1 Moly.
- 12 Cr., Aluminum
- 17 Cr.
- 27 Cr.
- 18-8
- 18-8 Titanium
- 18-8 Columbium
- 18-8 Molybdenum
- 25-20



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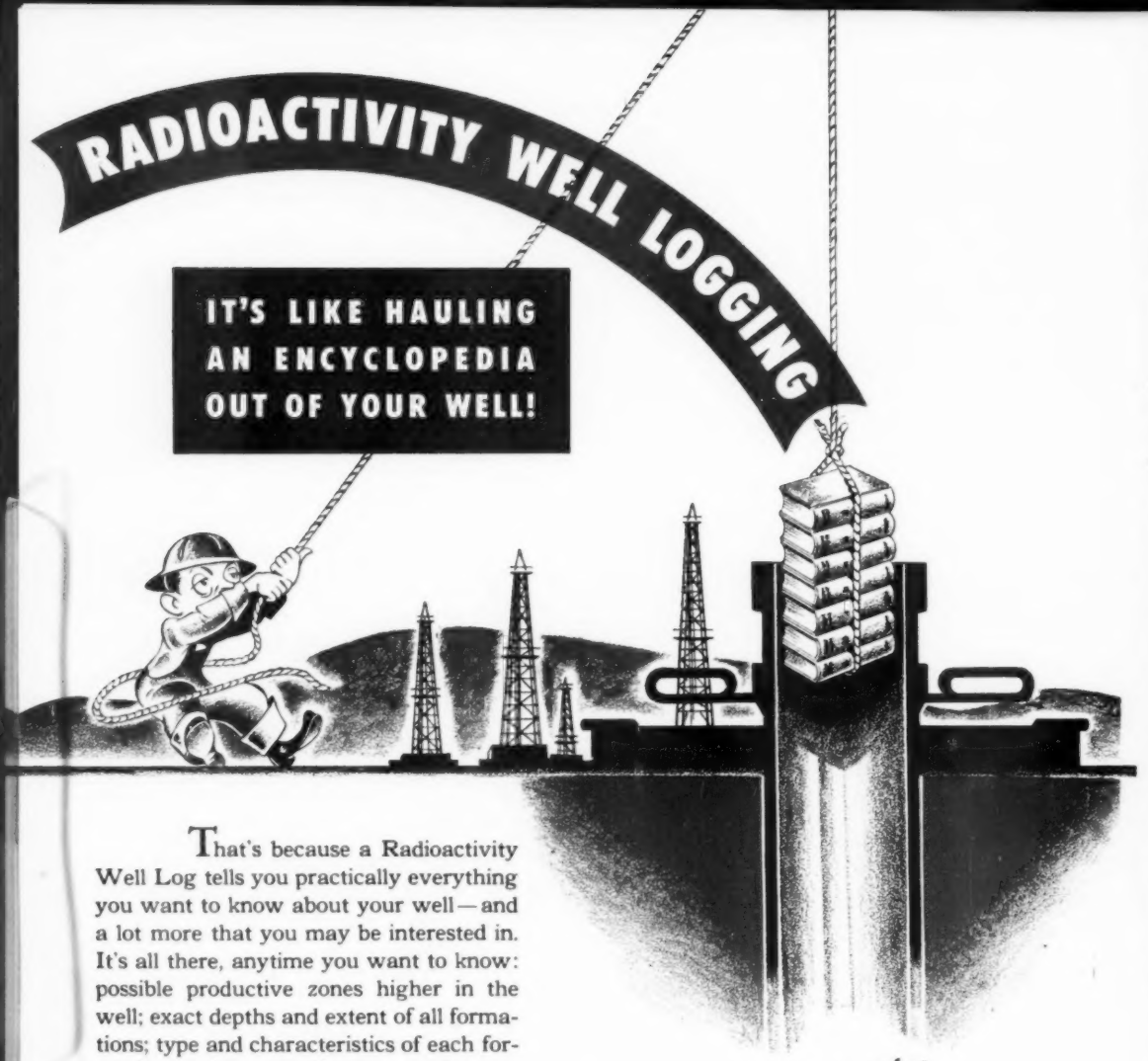

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AR 210

Published every Thursday by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa, Okla. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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JOURNALLY Speaking

Tide Water Tale

THERE is a general supposition that oil men are not interested in history, but this belief is rapidly being dispelled — or else the condition is being corrected — as witnessed by the growing number of oil companies to delve into their origins and family trees.

Latest such effort to cross our desk is a booklet by Tide Water Associated Oil Co. telling how it got that way.

Oil men whose memories go back beyond 1939 know that prior to that date the concern was two separate companies, one on the East Coast, the other on the West Coast. But it is an interesting coincidence that each branch of the now nation-wide, integrated company got into the oil business via the transportation end. Three men who later founded the original Tide Water fought teamsters and railroads to build one of the first pipe lines in Western Pennsylvania (35 miles of 3-in.) in 1874, and that gave them the idea for a big line to tidewater on the Atlantic Coast 300 miles away. Competitors ridiculed and obstructed, but the line finally reached Bayonne, N. J., in 1887. Meanwhile Tide Water got into other branches of the oil industry and before many years these became more important than the original transportation function.

In the early 1900's the Kern River field was brought in in California, and a group of former gold miners developed a way to flume the oil to railroad sidings by floating it on water. Then a pipe salesman, sensing a big market, induced the miners and a group of independent producers to form an "Associated Oil Co." to build a pipe line over the mountains to tidewater on the Pacific Coast. This company also pioneered in several pipe-line innovations, such as rifled pipe with water in the grooves to "float" heavy oil, and a two-way system which brought distillate from refinery to field to dilute crudes too heavy to pump otherwise. Associated, likewise, later widened out from its original objective and became an integrated oil company.

The only moral to this story is that with a little ingenuity and daring you can get into the oil business most any way—unless Congress should pass legislation making it illegal to be in more than one division of the industry at the same time.

Improving on Goethe

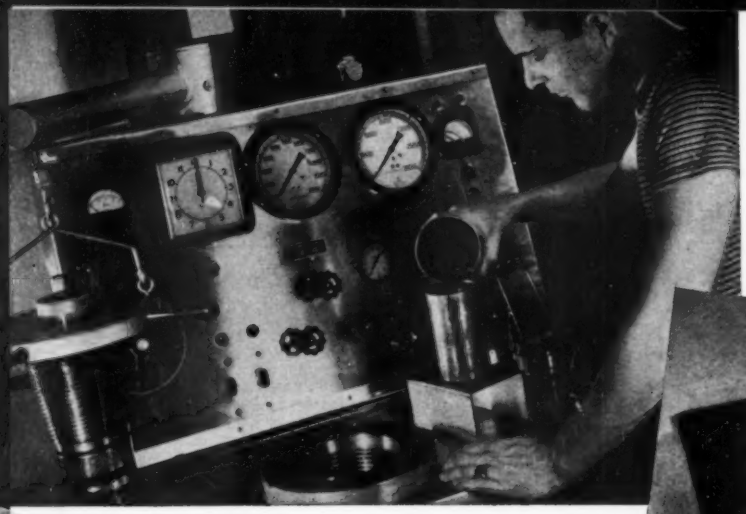
THIS year is the 200th anniversary of the birth of Johann Wolfgang von Goethe, who won lasting fame as the great German poet, dramatist, novelist, and philosopher.

But Goethe also was one of the first geologists. He was the first man to make a geological survey, the first to use colored charts to show geologic formations, and the first to suggest that confusion could be resolved by classifying particular formations according to the world epochs or ages to which they belong.

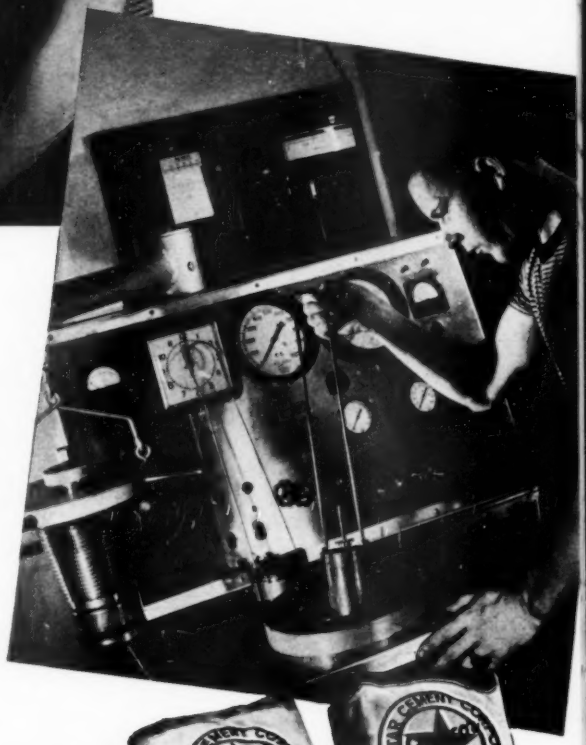
Much progress along these lines has been achieved during the intervening two centuries, but there is still some confusion as to the proper classification of the many oil-bearing formations found in various parts of the United States. So about a year ago our brains department took a leaf from Goethe's book and compiled a chart, colored, of course, showing the oil pay zones of the nation according to their geologic ages and correlated by regions so that you can tell at a glance, for example, that the Three Forks - Jefferson sand of Wyoming is practically the same thing as the Fusselman of New Mexico, the Frisco of Oklahoma, the Hunton of Illinois, or the Sylvania of Michigan.

Every subscriber got a copy as a matter of course, but it didn't end there because requests for extra copies started coming in immediately and have been continuing ever since. At 50 cents a copy it has become one of the best sellers of our Reader Service Department, and we had to make a reprint to take care of the demand. Old Goethe really started something.

Henry D. Ralph



High Pressure Consistometer in Lone Star's Oil Well Cement Research Laboratory tests thickening time of cement slurries at high pressures and temperatures. Left, pouring slurry into container. Below, placing sealed cement container in pressure chamber.



THIS TEST SIMULATES DEEP WELL CONDITIONS

Progress in testing oil well cements is illustrated by this pressure type consistometer, which can operate at pressures above 18,000 psi and temperatures up to 300° F. This modern thickening time tester determines the combined effect of pressure and temperature, making it possible to approximate conditions encountered in cementing even the deepest wells.

No amount of testing will solve all the problems encountered in the field... but the harder you try, the closer you come to providing the operator with adequate and reliable performance data... and the better able you are to make cements with the properties needed to meet the range of current cementing problems in the forward-moving oil industry.

Photo, below, shows test under way, with pressure raised to about 9500 lbs. per sq. in. This apparatus recreates, with high degree of accuracy, conditions of pressure and temperature encountered in deep, hot wells.

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the OIL AND GAS JOURNAL

VOL. 48. NO. 31 DECEMBER 8, 1949

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Subscription rate to the petroleum industry, United States and foreign, 1 year, $3.00. Single copies, 50 cents. Back copies when over a year old, one dollar. Note: Payments from outside the U.S.A. may be in the form of an international money order or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1949 by The Petroleum Publishing Co.

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DO YOU KNOW HOW "Metal Petals" BRING YOU SUCCESSFUL CEMENTING RESULTS?

In any cementing where a lower zone must be protected from contamination by the cement slurry (as well as from sloughings or cavings) the Baker METAL PETAL Basket will be found both safe and successful.

The unit is constructed of a number of individual "petals" made of flexible sheet metal. These petals are mounted on reinforcing spring steel ribs, which in turn are mounted on a ring to form the Basket.

When running in the hole, the upward pressure of the fluid tends to close the "petals" thus providing fluid passageway between the Basket and the walls of the hole, without distortion of the Basket. As soon as the casing comes to rest, upward pressure by the fluid is relieved and the petals expand to contact the walls of the hole. Any tendency of fluid to move downward then presses the flexible petals more firmly against the entire circumference of the hole. Solids strained from the fluid tend to build a bridge inside the Basket which is thus converted into a one-way packer of great strength and effectiveness.

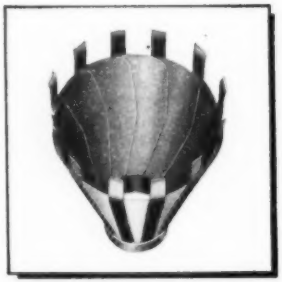
SIMPLE, EFFECTIVE ACTION

The "Metal Petals" not only expand to contact the entire circumference of large diameter holes, but also pack-off in holes of irregular shape; and the independent action of the individually mounted overlapping petals permits successful use of the Basket in casing programs with minimum clearances.

All-metal construction and design provide ample strength; lessen the possibility of splitting or otherwise damaging the Basket while it is being run in; and the metals are unaffected by usual acids employed for various purposes.

MOUNTINGS TO MEET ALL NEEDS

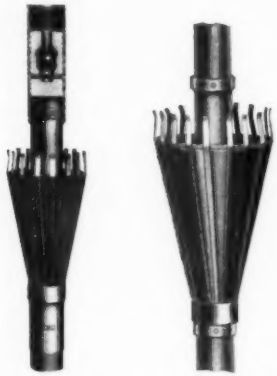
Baker Metal Petal Baskets are furnished mounted on plain or perforated nipples; with or without different types of Baker Whirler Float Collars; for a wide range of cementing applications. When conditions permit, it is recommended that Baker Metal Petal Baskets be "slidably" mounted to allow rotation, spudding, or reciprocation of the casing without distorting or damaging the Basket. Maximum efficiency of Baskets is assured when a Baker Model "G" Casing Centralizer is used immediately below the Basket assembly. For details see the Baker (or Composite) Catalog; or ask any Baker representative for specific recommendations.



TOP, Baker Metal Petal Basket (Product No. 340) ready for assembly into any required cementing hook-up. The strong, spring steel ribs, each with a "metal petal" attached, expand against the wall of the hole to form a safe "one-way" packer which prevents downward movement of the cement slurry.

LOWER VIEW illustrates the overlapping "petals" (each mounted on its individual spring steel rib) thus providing flexibility and freedom of expansion to pack-off around the circumference of large-diameter holes, or holes of irregular contours. A Baker Model "G" Casing Centralizer mounted just below the Basket is recommended.

LEFT, a popular hook-up consisting of a Baker Metal Petal Basket mounted on nipple, with a Baker Cement Whirler Float Collar with Solid Baffle (Product No. 305) which causes the cement slurry to pass through the baffled, side-whirler ports.



RIGHT- Where the casing is to be rotated or reciprocated while cementing, the Metal Petal Basket is "slidably" mounted between two Stop Rings. This permits free rotation, and ample vertical movement of the casing, without distorting or damaging the Basket.

HERE'S AN EXAMPLE OF STRENGTH

The Baker Metal Petal Basket holds a record for keeping cement ABOVE and OUT OF a "zone" possessing *lower formation pressure* and *higher permeability* than is likely to be encountered in any oil well. The "zone" was an *open* coal mine stope (lateral) through which a 16-inch hole had been drilled. A Baker Metal Petal Basket, mounted on 10¾" casing (used as the surface string) successfully supported a 640-foot column of cement slurry above the stope, without breakdown or leakage. This example not only demonstrates the bridging ability of the Basket assembly, but also is evidence of the tremendous structural strength which it possesses.

BAKER METAL PETAL BASKET PRODUCT NO. 340

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

A Unitization Problem

WHENEVER two or more operators who have responsibilities in connection with production of oil and gas get together, their conversations invariably drift to problems having to do with unitization. What to do to bring about a change in the attitude of some royalty owners in regard to unitized operations is a common subject of these discussions.

Rarely can anything be done in extending the economic life of the older fields unless producers are permitted to consider one or more pools as a unit. They must be in a position to carry on the latest operating practices without regard to lease lines except as guides to the equitable distribution of costs and profits.

Many of the secondary projects for the fields which have been producing 10 or more years involve new expenditures ranging up to millions of dollars. Payouts usually extend over long periods.

The greater stress placed on the application of conservation principles, starting with the primary operations, also emphasizes the need for the acceptance of certain unitization practices from the start of a new field. The disposal of casing-head gas without waste and the utilization of residue gas in pressure-maintenance and several other field practices are dependent on whether or not a pool can be operated as a unit.

Too often after the operators, with the approval of the state conservation bodies, have perfected a workable unitization plan for a field, its implementation is stopped by a small group of royalty owners. This unwarranted action on the part of minority interests is becoming increasingly serious. Washington is fully aware of this situation. It is pointed to by bureaucratic leaders as indicating the mistake made when the federal Government in its beginnings failed to reserve all the nation's mineral rights, particularly oil, to itself.

It may seem far fetched to some, but considering the trends of the times it is conceivable that future proponents of government ownership, given an excuse, will attempt to correct the original error. Until June 1947 no one had seriously questioned the right of the states to their tidelands. The Government up to now has been successful in nullifying efforts to reestablish, by congressional act, state ownership.

The oil country well knows that private ownership of minerals has played an essential part in the growth of the oil industry in this country. Royalty interests have aided in financing and in other ways have given impetus to the search for new oil and the development of proven fields.

But there is a very real danger now that misinformed or selfish minorities will jeopardize the continuance of a basic concept in the development of our petroleum resources. Here's an educational job to be carried on both within and outside the oil business.

THIS WEEK

INDUSTRY—Reserves of five fields in Scurry County, Texas, estimated at 1 billion barrels by speaker at Abilene meeting. . . . ¶First commercial installation of lorac stations completed on Gulf Coast. . . . ¶Merger of five independent companies nearing completion. . . . Deal involves Texmass Petroleum Co., Petroleum Reserves Corp., Midway Oils, Inc., Swiss Oil Co., and Cooperative Refinery Association. . . . ¶Humble completes new gas-distillate discovery in gulf off Louisiana coast. . . .

TECHNOLOGY—Radioisotopes seen as possible routine tool in petroleum industry as aids in studying engine wear, tracing oil flow through pipe lines, measuring thickness and liquid level, and other uses. . . . ¶Developments designed to achieve more efficient gasoline engines now being tested. . . . ¶New processes, products for petroleum industry shown at New York chemicals-industry exposition. . . .

GOVERNMENT—Supreme Court announces it will hear arguments on tidelands case February 6. . . . ¶Texas Railroad Commission orders ratable taking by Coltex Refining Co. from all wells in four southwestern counties. . . . ¶ECA says it will view critically all requests for funds with which to build European refineries. . . . Predicts a shrinking market for U. S. operators. . . . ¶Retiring Interior Secretary Krug steps down, commends National Petroleum Council for cooperation and assistance. . . .

INTERNATIONAL—Texas Petroleum Co.'s wildcat in Colombia's upper Magdalena Valley tests 800 bbl. of 33°-gravity oil. . . . Success marks first discovery since 1946. . . . Commercial possibilities not yet determined. . . . ¶Tropical tells Colombian Government it is not interested in part ownership of De Mares concession after ownership reverts to government. . . . ¶Important discovery in Emsland area of Germany flows 450 bbl. daily from stratigraphic trap. . . . ¶Union Oil Co. tells Paraguay Government it is pulling out of country. . . . Move brings to close 5 years of work during which company spent more than $7,500,000. . . .

TRENDS—Residual fuel stocks east of California are about 10,000,000 bbl. less than a year ago but at about the same level as at the end of November 1947. . . . November deliveries from refineries east of California were less than in November last year but increased imports and shipments from California raised demand above last year's November average. . . . ¶The short-term outlook for residual demand has been improved by decreased coal production but the basic problem of heavy fuel production remains. . . . ¶Suppliers expect better prices for Mid-Continent residuals before the end of the year. . . .

ECONOMICS—Current trends indicate fourth-quarter total demand may set all-time record of approximately 6,700,000 bbl. daily. . . . Consumption at this rate would mean stock withdrawals almost equal to postwar record set in December 1946. . . . ¶Industry and government leaders attending compact meeting are told only modest increases in demand may be expected in 1950. . . . ¶Uncertainty of coal supplies considered major factor in boosting utility use of gas and fuel oil to new record peak in October. . . .

PIPE LINES—Montana-Dakota Utilities Co., Montana-Wyoming Gas Pipe Line Co. proposals are given approval by FPC. . . . Latter firm will build 340-mile, 12¾-in. natural-gas line from Worland field in Wyoming to Fallon County, Montana; Montana-Dakota Utilities will lease and operate the line. . . . ¶Cities Service Gas Co. asks FPC approval of plans to construct 42½-mile natural-gas line in Kansas.

"SUPER INCH."—This view in the Panoche Hills south of Hollister, Calif., dramatizes the huge size of the 34-in. pipe line now being laid for Pacific Gas & Electric Co. to supply the San Francisco Bay region with natural gas from the Permian and San Juan basins of Texas and New Mexico. The northern 80 miles of this line are now in service, using gas from Kettleman Hills pending completion of the southern and eastern spreads

Record Oil Demand?

Trends suggest a December product demand averaging 6,700,000 bbl. daily, highest in industry's history

John C. Casper

WATCH December demand for petroleum. Current trends indicate that total demand may average 6,700,000 bbl. daily this month.

If so, this will be a new all-time record for consumption in any one month. It will also do much toward pulling the 1949 total up to a respectable level.

The record consumption in a single month now stands at 6,673,000 bbl. daily, established in December 1947. The second highest month in history was December 1948, with 6,626,000 bbl. daily.

In the years prior to the last war, and in all of the postwar years, total demand for crude and products has been greater in December than the average for the first 11 months of the year. The accompanying chart shows the percentage increase in December over the January-November average.

The smaller gain in December 1948 compared with that of the two previous years is explained by the fact that demands in the early months were boosted by very cold weather while the relatively mild weather in December tended to reduce demands for heating oils.

Demand in the January-November period of this year is estimated at about 6,015,000 bbl. daily, based on actual data for 9 months and indicated demands for 2 months from current weekly statistics. If demand in December reaches 6,700,000 bbl. daily it will represent a gain of 11.4 per cent over the 11-month average.

Gasoline.—Increases in domestic gasoline consumption compared with last year are running almost three times the loss in total exports. In the first 9 months of this year gasoline gains exceeded total export losses by 74,000 bbl. daily. If this holds true in December, and other product demands break even with last December, total demand would be about 6,700,000 bbl. daily.

Resid. — Residual demand has been improving in recent months. July demand was 2,500,000 bbl. less than the total for July 1948. The August loss was only 100,000 bbl. and September recorded a gain of 4,613,000 bbl. over September of last year. October demand was affected by the steel strike but current data indicate a November demand above last year's level. The short production week in the coal industry seems to assure at least a seasonal increase in residual demand for December.

Distillates.—Domestic demand for distillate fuels dropped sharply during the first few months of this year. At the end of July cumulative demand was running about 18,000,000 bbl. behind the previous year. By the end of September this deficit had been cut to about 13,000,000 bbl. Current reports indicate a further reduction in November. While distillate demand for the year may fall short of the record set in 1948, the several factors influencing consumption indicate an increase in December.

Railroad purchases of distillate in 1948 represented 9.1 per cent of total distillate sales, and distillate deliveries under this classification have increased more than 25 per cent in 1949. Consumption by electric-power plants has increased. Distillate bunkers laden on vessels in foreign trade are only slightly less than in 1948.

Sales of distillate fuels for heating accounted for 62.8 per cent of all distillate distributed in 1948. Fluctuations in sales under this classification represent the most unstable factor in distillate demand because consumption depends on the weather and indicated demand by months may vary with decisions by a large group of customers to change the normal pattern of fillup purchases. However, the over-all trend is toward greater use of distillate fuel for heating.

It is estimated that the number of oil burners in use is about 10 per cent greater than at this time last year. Installations in the first 10 months of this year ran about 30 per cent over the same period in 1948. Even with warmer weather than last year, distillate demand for heating should increase in December.

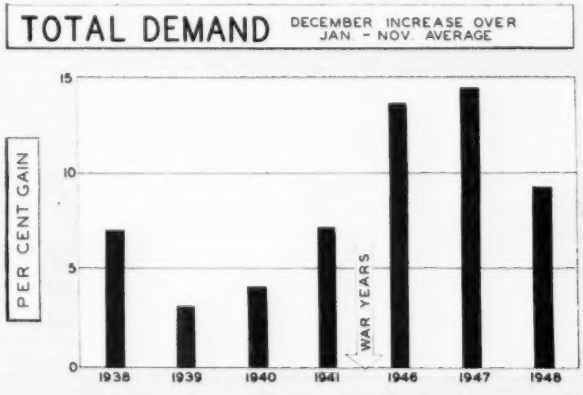
Stocks.—December demands of 6,700,000 bbl. daily would result in stock withdrawals almost up to the postwar record of 15,948,000 bbl. set in December 1946. Production of crude this month is expected to average about 4,915,000 bbl. daily. Condensate and other light-hydrocarbon production, plus imports, will bring total new supply up to about 6,190,000 bbl. daily. This would leave about 500,000 bbl. daily to be supplied from storage, or a total for the month of about 15,500,000 bbl. If demand drops slightly below the above estimate, or if new supply is a little larger, stock withdrawals would be reduced by a like amount, but it looks as if December is good for a stock drop of at least 12,000,000 bbl.

Record Utility Use

Consumption of gas and fuel oil by electric-utility power plants reached a new record peak in October according to the Federal Power Commission. Use of light and heavy fuel oils amounted to 6,655,555 bbl., an increase of 103.7 per cent over October 1948.

Gas consumption increased 2.2 per cent over September to 55,355,340,000 cu. ft. This exceeded the amount used in October 1948 by 21.6 per cent.

A major factor in these increases in demand for gas and fuel oils was the uncertainty of the coal supply. Coal consumption was down 27.5 per cent.



Offshore Discovery

Humble's latest Gulf producer brings up question of what to do with gas and gas-condensate production

Leigh S. McCaslin, Jr.

HOUSTON.—While the newspapers have been playing up the legal aspects of the tidelands fight, operators in the Gulf of Mexico have brought in two more gas-distillate producers—one discovery and one field well.

These two new producers are both off the Louisiana coast. The discovery is Humble Oil & Refining Co.'s A-3 Tiger Pass, in State Lease 818, Plaquemines Parish, which tested 24 bbl. of 64-gravity condensate and 734 M.c.f. of gas daily. It was drilled to a total depth of 11,122 ft., but was tested for production through perforations in 7-in. casing at 9,475-80. The gage was made on a 4-hour test through a ¼-in. choke.

Magnolia Petroleum Co. completed the development well in its Ship Shoal Block 72 field off Terrebonne Parish. It is the company's A-2 well, state lease 766, with an initial production of 3 bbl. of condensate and 1,007 M.c.f. daily of gas. Magnolia also found a good gas sand last week in its Block 53 wildcat off Terrebonne Parish, but has not yet completed the test. On test of perforations at 11,206-208 ft. a shut-in pressure of 3,675 psi. was built up.

The two completions bring to the forefront again the recurrent question, "What do we do with offshore gas and gas-condensate production?" Two Magnolia Petroleum Co. exploration engineers, speaking in Chicago recently, asserted that utilization of offshore gas awaits firming up of the reserve estimates and a price sufficiently above onshore prices to justify the higher development costs.

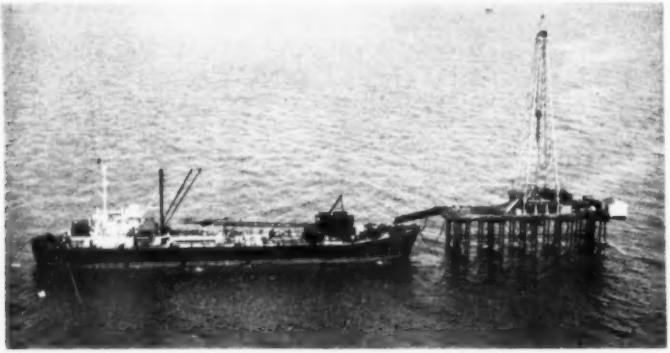
Some have questioned the feasibility, from an engineering standpoint, of laying offshore pipe lines. However, Henry C. Cortes and R. N. Gsell, the two Magnolia engineers, believe that the technology of such lines has been established by successful underwater lines in other parts of the world. Total reserves tapped by the 11 discoveries, which had been made at the time Cortes and Gsell prepared their paper, were estimated by them at 2 trillion cubic feet. They ventured a guess that ultimate discoveries may be two to four times this figure, or a possible reserve of 8 trillion cubic feet.

It is known that one company has been attempting to work out a cooperative deal to transport offshore gas to land. The plan, according to some reports, is to run a trunk line along the Louisiana coast with gathering lines to the various offshore fields. An attempt was made to interest all companies with offshore gas production. So far as is known, nothing concrete has yet resulted from these discussions.

Since the war, there have been 12 gas-condensate and 2 dry-gas discovery wells completed in Louisiana Continental Shelf waters. Texas has had none. This compares with a grand total of 89 completions for both states, including 25 oilers and 50 dry holes. Twenty-one discoveries, when oilers are added, are included in the 89 completions. All are off Louisiana. (See accompanying table.)

GULF DISCOVERY WELLS COMPLETED SINCE WORLD WAR II

Field	Completion date	Initial daily production: Bbl.	Initial daily production: Cu. ft.
Barnsdall Oil Co.:			
Breton Island, gas-condensate	9-30-48	78	
Breton Sound Block 32, oil	8-26-49	187	
Breton Sound Block 36, gas	4-11-49		2,350,000
The California Co.:			
Main Pass Block 69, oil	8-10-48	205	
Bay Marchand, oil	3- 5-49	255	
Humble Oil & Refining Co.:			
Grand Isle Block 16, oil	12- 2-48	219	
Grand Isle Block 18, oil	8-16-48	878	
South Timbalier Block 34, oil	3-29-49	456	
West Delta Block 30, gas	4- 7-49		no gage
Tiger Pass Block 27-gas-condensate	11-15-49	24	734,000
Kerr-McGee Oil Industries, Inc.:			
West Cameron Block 33, oil	8-22-49	932	
Ship Shoal Block 32, oil	11-14-47	897	
Ship Shoal Block 28, gas-condensate	7-20-49	69	3,460,000
Magnolia Petroleum Co.:			
Eugene Island Block 110, gas-condensate	7-29-49	46	
Eugene Island Block 45, gas-condensate	11- 7-49	60	1,260,000
Ship Shoal Block 72, gas-condensate	8-20-48	118	
Pure Oil Co.:			
Vermilion Area Block 39, gas-condensate	6- 8-49	53	
Stanolind Oil & Gas Co.:			
West Cameron Block 45, gas-condensate	5-21-49	40	3,590,000
Superior Oil Co.:			
Vermilion Area Block 71, gas-condensate	7- 2-48	53	7,024,000
West Cameron Block 149, gas-condensate	9-16-49	7	3,355,000
Vermilion Area Block 76, gas-condensate	4-27-49	12	7,365,000

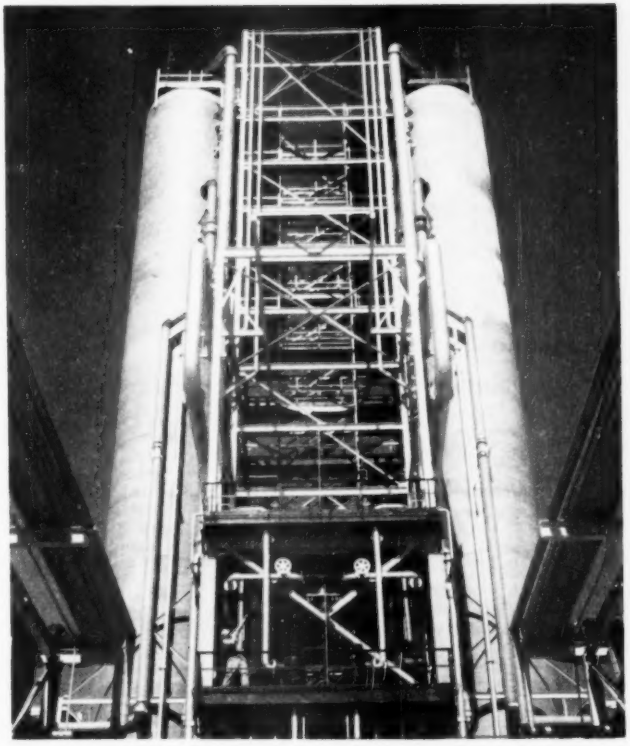


The twelfth gas-condensate discovery to be made in Louisiana and Texas Continental Shelf waters has been made by Humble Oil & Refining Co. using the type of equipment pictured here. This L.S.T.-platform combination method of offshore drilling has been used extensively by Humble. The company has 12 platforms erected and one building in the Gulf at present for this type of drilling. Humble has been quite active offshore, having completed 20 wells with 5 discoveries, 4 field producers, 9 dry wildcats, and 2 dry field wells

Tidelands Argument Set

WASHINGTON.—The Supreme Court announced this week that it will hear argument in the Texas and Louisiana tidelands cases February 6.

The court's action in effect was a rejection of the motions of the two



HEART OF CIT-CON.—These twin vacuum-distillation towers at Cit-Con Oil Corp.'s new lube-oil refinery at Lake Charles, La., each 119 ft. tall and 13 ft. in diameter, take the "heart cut" from 18,000 bbl. of the lubricating fraction of crude oil daily and pass it to other units which produce 6,000 bbl. daily of five grades of lube-oil base stocks. The $42,000,000 plant, world's most modern solvent-refined lubricating-oil refinery, was formally opened by Cities Service Co. and Continental Oil Co. December 8. Full description of the plant will appear in next week's Journal

states for special treatment of the cases, as well as of the Government's motion for an immediate decision.

The announcement was expected to bring a lull in the barrage of charges and counter charges between the Department of Justice and attorneys representing Texas and Louisiana.

Texas and Louisiana had accused the Government of pressing for undue haste in the disposition of its tidelands suits.

Solicitor General Philip B. Perlman, however, accused the states of attempting to maneuver the Supreme Court into delaying action. He asked the court to dismiss motions of Texas for appointment of a special master to take evidence and for permission to take depositions from elderly Texans and to deny Louisiana's request for a trial by jury.

The ownership of the submerged Gulf lands should be decided as a matter of law, not of evidence, Perlman said, asserting that the only question at issue is whether the California decision applies to Texas and Louisiana.

Lorac in Service

GALVESTON.—The first commercial installation of lorac stations for offshore surveying and position locating in geophysical work has been completed by Seismograph Service Corp., and test patterns are being broadcast.

The network of one master and two slave broadcasting stations stretches from the Bolivar Peninsula, east of the city of Galveston, to Choclate Bayou, near Liverpool, Brazoria County, and to near Sargent, Matagorda County, along the east end of Matagorda Bay, a total distance of about 70 miles.

Lorac is a system of using radio broadcasting stations on land to permit boats offshore to determine their geographic position with very close accuracy. It uses medium-length radio waves which, unlike radar, are not limited to "line of sight," and boats can operate 100 miles from shore but still determine their position by signals from land stations. *(For complete details of lorac, see The Oil and Gas Journal, June 17, 1948, page 58).*

The new network is the first to operate on the radio frequency band of 1,750-1,800 kc., assigned by the Federal Communications Commission for "Radio Location Service." The stations are rated at 500 watts each, and each has a 100-ft. vertical radiator-type antenna.

Humble Oil & Refining Co. and Sun Oil Co. boats and geophysical crews will cooperate in the first experimental tests under actual operating conditions. Lorac receiving equipment is now being installed on the boats.

SOUTHWEST

Scurry Appraisal

Reserves of reef fields placed at 1 billion barrels

D. H. Stormont

ABILENE.—The new oil reserves added by Scurry County's reef fields were placed at about 1 billion barrels by J. R. Day, district geologist for Pan-American Production Co., in his address before the annual meeting of the West Central Texas Oil and Gas Association here last week.

Expressing the opinion that all five reef fields are producing from a massive reef some 20 to 25 miles long, he predicted that some 50,000 acres would prove productive.

Basing his predictions on present geological controls, Day said he believes that ultimately North Snyder, Kelly, Schattel, Diamond-M, and Sharon Ridge (Canyon) fields would prove to be one reservoir.

He said there probably would be some dry spots within the area, where the reef is not sufficiently developed to extend above the oil-water contact, and that around the edges of the field tight sections would cause other wells to be nonproductive. Using the old "rule of thumb" estimate used in other west Texas lime fields of 200 bbl. per net acre-foot of reef pay, he predicted the area would yield in the neighborhood of 1,000,000,000 bbl. of crude.

Well estimate.—Using the boundaries which he tentatively assigned the

field. Day stated there should be about 1,250 wells drilled if the 40-acre spacing pattern is carried out. With more than 200 wells completed and some 130 rigs actively engaged in developing proved locations, he predicted that the majority of the wells would be drilled within the next year.

His forecast of the importance of Scurry's reef fields came during the technical session of the 1-day meeting at which five other papers were given. Following the annual banquet that evening, and preceding the "Fort Phantom Finagle of 1949," two addresses on nontechnical subjects were also given. J. Ed Warren of Midland, president of I.P.A.A. spoke on "Current Problems of the Oil Industry," and Dr. George S. Benson, president of Harding College, Searcy, Ark., made a talk on "Our American Heritage." This year's finagle, "decomposed and misdirected" by Frank B. Counselman, Abilene consulting geologist, dealt with "The Flurry in Scurry and How to Get Well in a Hurry."

Officers named.—Also at the banquet, which was attended by more than 800 oil men and their wives, French Robertson, Abilene, was made association president for the coming year. He succeeds V. C. Perini, Jr., also of Abilene. Other officers chosen were J. C. Hunter, another Abilene independent, first vice president; and Lester Clarke of Breckenridge, second vice president.

In the morning technical session W. D. Owsley, Halliburton Oil Well Cementing Co., Duncan, Okla., spoke on the Hydrafrac process; W. L. Horner, chief engineer for Barnsdall Oil Co., Tulsa, presented case histories of several fields where oil recovery had been increased by means of water-injection pressure maintenance; and A. E. Sweeney, Jr., of the Interstate Oil Compact Commission, Oklahoma City, told of the findings of the national stripper-well survey.

In the afternoon session, in addition to Day's address, G. H. Brodie of Abilene spoke on "Structure-Forming Roll of Reef Masses in West Central Texas." "Permeability Surveying and Controlled Acidizing," was presented by **B. M. Kingston**, chief engineer for Chemical Process Co., Breckenridge.

Scurry County Speedup

Starting immediately, Lion Oil Co. is accelerating the development of its holdings in the Diamond M field, in Scurry County, Texas, by placing nine additional drilling rigs in operation. The addition gives the company a total of 16 rigs in the field.

Even with the expanded drilling program, the company does not expect to be able to develop fully all of its acreage in the area until well into 1950, Col. T. H. Barton, chairman of the board announces. In this and the adjacent Sharon Ridge Canyon field, the company now has 5,600 acres under lease, he said.

To date, the company has completed 39 producing wells in the Diamond M field.

Consolidation

Merger of five independent companies nearly complete

DALLAS.—Consolidation of the oil and gas properties of five independent companies into the new firm of Texas Consolidated Oils is nearly completed, according to A. W. Smith, president of Texmass Petroleum Co.

The properties to be consolidated are those of Texmass and Petroleum Reserves Corp., Dallas; certain leases owned by Midway Oils, Inc., Topeka, Kans.; Swiss Oil Co., Dallas; National Cooperative Refinery Association, Wichita, Kans.; and "a number of outside investor interest associates with Texmass." Leases and properties involved are located in Texas, Oklahoma, New Mexico, Kansas, California, and Louisiana.

Total value of the properties to be consolidated, according to Smith, is more than $40,000,000. Gross income from these is now running at the rate of more than $200,000 a month, he said. Financing of the merger will be "assisted" by a loan of $15,100,000 from Reconstruction Finance Corp.

Smith stated that the loan has been approved, subject to certain qualifications under the conditions of the loan. One of these, expected to be met by the end of the year, is the revamping of Texmass under the name of Texas Consolidated Oils.

Properties of National Cooperative will be purchased outright, but owners and stockholders of the other properties will receive common stock in Texas Consolidated.

Proposed officers of the new firm are A. W. Kincade, president of Fourth National Bank of Wichita, chairman; E. H. Hatcher, president of Midway Oils, president; A. W. Smith, treasurer; and M. A. Porter, secretary of Texmass, secretary.

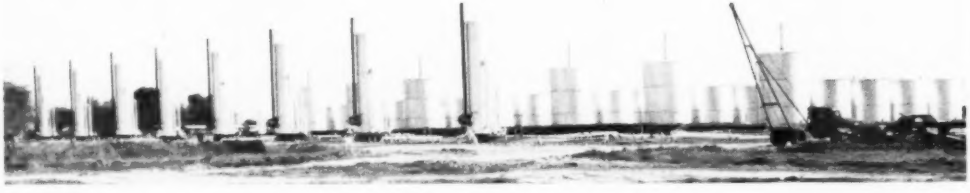
Ratable Taking Ordered

AUSTIN.—Coltex Refining Co. has been ordered by the Railroad Commission to take oil ratably from all wells connected to its pipe lines in Howard, Glasscock, Mitchell, and Scurry counties.

It was the first case under the commission's antidiscrimination rule since 1945, when Superior Oil Co. of California protested action of Shell Oil Co. in prorating producers in West Texas, TXL field.

At a hearing on the case the commission heard testimony that Coltex gathered 100 per cent of allowable production in two Sharon Ridge fields in Scurry and Mitchell counties. It also was told that the company was taking only 33 to 70 per cent of allowables from wells in Howard Glasscock, Iatan East Howard, Iatan North Howard, Westbrook, and Snyder fields.

In making its decision, the commission said that most connections under dispute draw from limited producers or marginal wells and that failure to produce them would cause premature abandonment.



***BIG TANK BATTERY.**—Dual completions which called for separate storage for production from each zone are responsible for this array of tankage. The eight tank batteries contain production from a 240-acre, 19-well tract in La Gloria field, Texas, and are owned by Fair & Woodard, Inc., San Antonio. In each battery are four 1,000-bbl. tanks and a 1,500-bbl. gun barrel. Each battery is equipped with a large heater-treater. Eleven of the 19 wells are dual completions. Four sands produce gas and distillate in the field from the Frio-Vicksburg section between 5,000 and 7,000 ft. Residue gas is returned to the formation*

Little Change in '50

Men at compact meeting think next year will see only a modest demand increase, supplied in part by imports

C. O. Willson

NEW ORLEANS. — The optimistic predictions of early fall regarding the total demands for petroleum in 1950 in this country will have to be scaled down to a modest 2 or 3 per cent, part of which probably will be supplied by further increases in imports.

The foregoing appears to be the consensus of those in attendance at the winter meeting of the Interstate Oil Compact Commission here December 5-7.

Those who expressed opinions talked in terms of 175,000 to 200,000 bbl. daily increases in demand for the early part of 1950 over the same period last year, with the possibility of slightly larger gains later in the year. Just what this will mean in demands for domestic crude oil will depend on the stock situation at the close of the year and trends in imports for the first quarter of the new year.

Little change seen.—The economics advisory committee made no predictions for 1950 but said that the total demand for this year would be about the same as in 1948.

It is believed that the decline in demand of 1½ per cent for the first 9 months will be largely offset with an increase for the final quarter so that the year will be within ½ per cent up or down compared to 1948, Dr. R. J. Gonzalez of Humble Oil & Refining Co., chairman of committee, explained.

While the last-quarter gain was not as great as predicted, some members of the committee feel that the small gain reflected a turning point from the marked declines of early 1949 and augured well for the trends next year. The gasoline demand for this year will be in excess of the 5 per cent generally predicted, the committee found.

Year of transition.—It was stressed that this year has been one of transition from the rapid gains in demands during the 1946-48 postwar period. In 1948 an average of 291,000 bbl. daily was added to stocks. This year will end with practically no change in total stocks. Gasoline and middle-distillate stocks will be greater but crude oil and heavy-oil inventories are less. Imports this year must also be considered, the increase of 122,000 bbl. daily making a difference of 413,000 bbl. daily when 1948 domestic supplies are compared with the operating levels this year.

The committee saw no changes in basic conditions which would indicate a leveling off or reductions in future demands for the principal products.

Cycling Benefits Extolled

NEW ORLEANS. — The comparatively new production arts of cycling and pressure maintenance are already important factors in the total supplies of liquid petroleum in this country and are major agencies of conservation in that they have increased oil and gas recovery and prevented waste.

Both cycling and pressure maintenance will continue to expand rapidly provided operators and the state conservation bodies are permitted to set up the necessary practices for efficient and economic application.

These conclusions were made in a series of state reports to the Interstate Oil Compact Commission here December 6.

Gov. Allan Shivers of Texas said that operators in his state have invested $250,000,000 in 35 cycle plants connected to more than 700 oil wells and more than 500 gas wells. The plants have processed 65 billion cubic feet of gas in one recent month and produced 78½ million gal. of natural gasoline and liquefied gases. After liquids were extracted, 75 per cent of the gas was returned to the ground for future use, and the financial return is about four times that of natural gas.

O. C. Bailey of Arkansas estimated that in his state pressure maintenance and cycling will recover between 111,500,000 and 208,000,000 bbl. of liquids that would not be recovered by primary methods.

H. M. Morse, secretary of the Mississippi Oil and Gas Board, reported that pressure maintenance and the recovery of light products in Cranfield and Mallalieu fields will increase the revenue from recovered liquids by 30 per cent. Other fields are to be unitized to carry on similar operations.

Engineers from the Louisiana Department of Conservation presented a report showing the application of these and other conservation principles in the operation of 15 fields.

Discussion of cycling and pressure maintenance was one of the feature topics of the meeting, and an entire session was devoted to it. Oral reports were presented by officials of several states, and other state reports are being presented in writing. The entire series will be made available to members of the compact and to the oil industry, promising a volume reviewing recent progress in this activity and the economic benefits it has provided.

State Control Defended

NEW ORLEANS.—Four governors of oil states attending the Interstate Oil Compact Commission's winter meeting here December 5-7 pledged themselves to do everything in their power to prevent federal encroachment on the affairs of the oil and gas industry.

Gov. Frank Carlson of Kansas, chairman of the commission, stressed the fact that the compact was organized to promote conservation by voluntary agreement, and not only the states and the oil and gas business but the nation's entire economy have benefited.

"In spite of this record," Carlson said, "there are those in Washington who seek to control the production of oil and gas without regard to local state governments. The problems of oil and gas conservation are complicated and diverse. Each oil and gas field requires special consideration before proper conservation regulations can be promulgated. This can only be accomplished by local control."

The chairman reviewed the activities of the 21 member states during the 14-year existence of the compact, explaining the progress in both the legal and technological aspects of conservation and sound production practices.

Gov. Earl Long of Louisiana said that the exercise of sovereign power is necessary in the development of oil and gas and this could be administered by the states.

Gov. Allan Shivers of Texas said that the oil states cooperating through the compact have demonstrated that they can handle all problems incident to oil and gas production. "If we have failed in any phase," Shivers declared, "it is in the phase of public information and popular support. It is rather obvious that the public is not fully aware of the import of this conservation program or of the dangers that lie in the alternative—which is federal control."

Gov. John M. Bonner of Montana, attending his first compact meeting, in an interview said he hoped that the coastal oil states would win in their tidelands fight. "I am at heart a states' righter," the Democrat governor of an inland state said.

Radioisotopes and Oil

Newest research tool getting cheaper, may soon have many routine applications within petroleum industry

George Weber

NEW YORK.—Radioisotopes, industry's newest tool, are finding greater and more diversified uses in the petroleum industry than anywhere else.

And they are now available in such adequate supply and at such a reasonable price that this byproduct of nuclear fission may soon be used as everyday routine in dozens of petroleum operations.

The use of radioactive elements as tracers has been applied in medicine and biology for the past 10 or 15 years, but they have been available for chemical and engineering research only since the advent of the nuclear chain reactor developed by the Atomic Energy Commission.

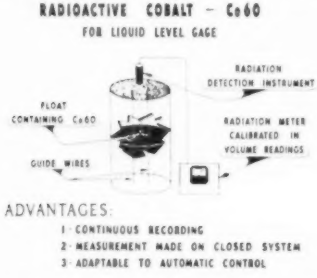
Now the AEC has an active distribution system to promote the use of isotopes in industry, and it is producing them is such quantities that the former priority system has been abandoned.

The price has been reduced drastically. While one gram of uranium costs $25,000, the same work may now be done with radio-activated cobalt costing $50 a gram, or in quantity as little as $5 per gram.

These developments move radioisotopes from the field of research into industrial applications, and the petroleum industry is in the van in putting them to work.

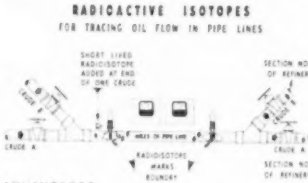
Some of the more successful applications of radioisotopes in the oil industry were described to the American Society of Mechanical Engineers last week by Dr. Paul C. Aebersold, chief of the AEC's isotopes division. Among these he listed:

Engine wear.—The study of wear in gasoline and diesel engines with



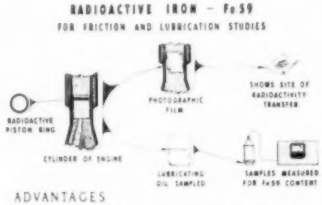
different types of lubricants has advanced manyfold through use of radioactive piston rings whose wear under identical conditions of engine operation can be measured rapidly for different lube oils.

Pipe-line batching.—Use of a radioactive element which is soluble in oil and insoluble in water has been found successful in tracing oil flow through pipe lines. In long trans-


RADIOACTIVE ISOTOPES
FOR TRACING OIL FLOW IN PIPE LINES
SHORT LIVED RADIOISOTOPE ADDED AT END OF ONE CRUDE
SECTION NO. 1 OF REFINERY
CRUDE A
CRUDE A
RADIOISOTOPE MARKS BOUNDARY
SECTION NO. 2 OF REFINERY
ADVANTAGES
1 RADIOACTIVE "MARKER" CAN BE TRACED OVER LONG DISTANCE
2 "MARKER" SPREADS TO ONLY SMALL OIL VOLUME
3 PERMITS SEPARATION OF CRUDES WITH MINIMUM OF LOSS
4 METHOD QUICK AND REQUIRES NO SAMPLING

mission lines, where various crudes or products are moved in slugs or batches, insertion of the radioactive material between differing streams allows rapid switching at the receiving end to avoid undue mixing and contamination. Isotopes for this use should be those with half-lives of a day or so. Such short-lived isotopes quickly lose their radioactivity, so that once their usefulness as markers is past they may safely be processed with the oil and will not retain sufficient radioactivity to be harmful when they emerge with petroleum products.

Liquid-level measurements.—Radiation from an internal float containing radioactive cobalt, for example, can be measured either at the top or sides


RADIOACTIVE IRON – Fe59
FOR FRICTION AND LUBRICATION STUDIES
RADIOACTIVE PISTON RING
PHOTOGRAPHIC FILM
SHOWS SITE OF RADIOACTIVITY TRANSFER
CYLINDER OF ENGINE
LUBRICATING OIL SAMPLED
SAMPLES MEASURED FOR Fe59 CONTENT
ADVANTAGES
1- TRANSFER OF METAL MEASURED TO [illegible] OUNCE
2- OIL SAMPLED DURING OPERATION OF MOTOR
3- DEVELOPED FILM SHOWS LOCATION OF WEAR

of the vessel by detection instruments which are calibrated to give direct readings of internal liquid level. This application has the advantage of continuous recording, adaptability to automatic control, and simplicity of a closed system.

Measuring thickness. — Radioactive thickness gages, now in commercial production, are found useful in nondestructive gaging of all types of materials of various densities and thicknesses. These promise useful application in measuring thickness of vessels and lines during operation in refineries. They even will measure the thickness of coatings and linings of materials when access to only one surface is possible. By measuring the back-scattering of radioactive rays, reflection-type gages can be used in determining degree of wear. This procedure in turn offers the possibility of anticipating replacement and repair of vessels and lines during upcoming turnarounds. It also promises use in determining how much longer an equipment item may be safely left in service.

Tracers.—Employment of isotopes as tracer atoms in investigating corrosion catalysis, well logging, detergency, and diffusion also is growing. Dr. Aebersold stated that some 80 companies are now using isotopes prepared by AEC for solving industrial problems. Of these companies 15 or more are working on research which directly and indirectly affects the petroleum industry. These include the research subsidiaries of such major companies as Gulf Oil Corp., Socony-Vacuum Oil Co., Standard Oil Co. of California, Standard Oil Co. (N.J.), The Texas Co., and Union Oil Co. of California.

Safe handling.—In a companion paper, G. G. Manov and D. O. Lintz of AEC discussed the hazards of handling isotopes and outlined the principles for safe handling of radioactive materials. They concluded that radioisotopes can be handled without undue danger to the user provided the necessary precautions are understood and employed. They described numerous survey instruments now available which will determine amounts of radiation and contamination, and listed values of maximum permissible exposure to five types of radiation, used at Oak Ridge. The fact that no permanent radiation injuries or deaths have occurred in the commission installations stands as proof that official precautions used are adequate.

The continuous training program conducted by AEC isotopes division for industrial and research personnel has to date trained over 400 persons in the safe handling of radioactive materials. These 1-month courses, restricted to 32 students at one time, will continue at least through March, and companies interested in sending employes may contact the Oak Ridge Institute of Nuclear Studies.

Product Preview

Oil industry gets look at new processes, devices

NEW YORK.—A vast array of new equipment, new processes, and new products made up the annual Exposition of Chemical Industries, held last week in Grand Central Palace.

Among the 3,000 displays of the more than 400 exhibitors were these of interest to the petroleum industry:

1. A new instrument control board which comprises an illustrated and animated flow diagram of a process, by means of gages, recorders, and simulated vessels and lines, this graphic panel board provides a concentrated picture of the process. It simplifies the operator's work by providing visual data on conditions at each step. In addition to simplifying the understanding of process control by nonengineering personnel, it brings the entire process within immediate view and reduces the size of control rooms. (Brown Instruments Division of Minneapolis - Honeywell Co.).

2. A new product for possible use as a catalyst in hydrocarbon synthesis. The product is iron penta carbonyl, $Fe(CO)_5$, a yellow to dark-red liquid. As a catalyst, this compound is said to show properties similar to those of cobalt carbonyl and nickel carbonyl. An additional possible use of the new product is that of an antiknock ingredient for gasoline and diesel fuels. On the basis of tests to date it was reported that iron penta-carbonyl shows results similar to those of equal parts of tetraethyl lead. However, iron deposits are known to exist over long periods of use, and the compound also is highly toxic and exposure to the pure substance produces immediate and delayed poisoning. (General Aniline & Film Corp.).

3. A new clad steel which is expected to find particular adaptation in vessels and equipment handling sulfuric acid. It comprises a composite plate consisting of a low-carbon or low-alloy steel backing plate, to one or both surfaces of which is uniformly and permanently bonded a cladding or Carpenter Stainless Steel No. 20 (nickel, chromium, molybdenum, copper). Standard claddings of 20, 25, or 30 per cent of total plate thickness are available. (Lukens Steel Co., "Stainless 20.")

4. A new line of electronic instruments which will measure contamination of personnel and equipment by radioactive isotopes, now available for increasing research work in all divisions of the industry. Formerly used only by government laboratories, a new "count-rate meter" and hand and foot monitors will be available for commercial use about the first of the year. These instruments provide direct readings of radiation and of degree of contamination on operators' hands and feet. (Radio Corp. of America.

Among the oil companies participating were Bareco Oil Co. and Socony-Vacuum Oil Co., featuring micro-crystalline waxes and other petroleum derivatives of use to the chemical industry generally.

Engine Research

CAMBRIDGE, Mass.—Two new developments in automotive engineering, designed to help achieve more efficient gasoline engines, are under test by Massachusetts Institute of Technology.

Fundamental research on how engines grow, making it possible to obtain facts about large engines from studies of very small ones, is the objective of attempts to develop laws of similitude under which a simplified working model would reveal the characteristics of a large engine before it is built.

Another project aims at improving engine performance through a new indicator capable of very accurate and sensitive measurements on pressures inside an operating engine.

EASTERN

Foreign-Oil Refinery

Domestic crudes not barred, but Texaco's 40,000-bbl. Eagle Point units are designed for high-sulfur imports

George Weber

WESTVILLE, N. J.—Imported crude oil has a permanent place in the long-range plans of The Texas Co., officials of the company made plain at the dedication of their big new Eagle Point refinery here, just across the Delaware River from Philadelphia.

But no oral confirmation of this was needed by any oil man after examining the specifications and operating program of this plant. It was frankly designed from the ground up to handle foreign as well as domestic crude. And the operations which have now begun clearly indicate that foreign crude is not viewed as a remote alternative but is considered a basic material for Eagle Point.

Texaco officials here for the opening ceremonies stated that the company's 15 refineries in the United States, including this new one, are currently running in excess of 400,000 bbl. of crude per day, and could increase this to about 490,000 bbl. daily.

The Texas Co.'s Eagle Point Works was officially "opened" last week as Gov. Alfred E. Driscoll of New Jersey threw a switch in the new 40,000-bbl. refinery. Left to right, Harry T. Klein, Texaco president; Governor Driscoll; Michael Halpern, vice president in charge of refining; and A. M. Martin, superintendent of Eagle Point Works. In a forthright address at the dedication ceremony, the newly reelected governor stated that venture capital is just as much dedicated to making jobs as it is to making profits. He cited the petroleum industry as particularly outstanding in understanding the relationship between management and labor

Domestic crude production of the company now approximates 300,000 bbl. per day. The difference is supplied by domestic purchases and foreign imports.

During 1950 the company plans to import an average of about 72,400 bbl. of crude daily, it was brought out, 20,000 bbl. from Arabia and 52,400 from Venezuela. The 1949 imports of this company will average about 46,527 bbl. daily. In 1948 Texaco's imports averaged 11,946 bbl. daily.

Sulfur.—Most of this imported crude has a much higher sulfur content than domestic crudes, and the Eagle Point plant, with a charge capacity of 40,000 bbl. per day, is specifically designed to handle such sour crudes throughout. This fact alone is not enough to bar domestic crudes, as the plant is sufficiently flexible to handle many types, but it is no secret that it is the present intention to operate it almost exclusively on the company's production from Saudi Arabia and Venezuela.

An interesting adjunct is the project for the recovery of elemental sulfur from the sour crudes processed at Eagle Point. Adjacent to the refinery, Freeport Sulphur Co. is completing a plant to produce between 8,000 and 12,000 tons per month of pure sulfur from the hydrogen sulfide gas separated in the refining process. This is the first such project in the East, though sulfur is being recovered successfully from refinery and field gases in Arkansas, Wyoming, and California, as well as at some foreign refineries.

Trends.—There are other significant features of this new refinery.

1. It is the first refinery of The Texas Co. on the Eastern Seaboard, except for two small skimming and asphalt plants. Unlike most large marketers in the East, this company has supplied its markets with products refined closer to areas of crude production. Locating the refinery in the consuming region will bring economies in transportation, especially when using imported crude.

2. The new plant accentuates the general trend toward locating refining facilities in consuming areas rather than in producing areas. The New Jersey - Delaware Bay region now has refining capacity almost equal to that of the Gulf Coast.

3. It is a further step in the program of The Texas Co., and others, toward large, complete refineries and away from scattered small ones. Within recent months Texaco has expanded the capacity of its refineries at Port Arthur and Tulsa, and is beginning new construction at Lawrenceville, Ill. It has closed smaller, less efficient refineries at Houston, San Antonio, and Dallas. The Eagle Point plant is so designed that its capacity can be doubled or quadrupled at any time.

WATCHING WASHINGTON

Bertram F. Linz

Chapman Takes Over

Oscar L. Chapman was sworn into office as Secretary of the Interior December 1. He told more than 1,000 officials and others gathered for the ceremony that he is approaching his job in the interests of all the people and "not against any group or against any concept of business or industry."

The thirty-third man to occupy the post since the department was created 100 years ago last March, Chapman succeeded Julius A. Krug after 16 years' service in the department as assistant secretary and more recently undersecretary.

"The future of our nation and people," the new secretary said, "will depend on the wisdom and vigor with which the Deparment of the Interior discharges its responsibility to safeguard, develop, and utilize the natural resources necessary to sustain a free and thriving society. We can remain strong and prosperous only if we conserve these great resources for all to share and to provide full opportunities for individual enterprises needed in an expanding economy."

Chapman takes over at a time when the department again is deep in matters important to the industry, such as administration of the tidelands if and when Congress enacts the necessary legislation; development of the synthetic-liquid-fuels industry; and revision of leasing regulations.

Dollar Battle Looms

Western Europe's dollar gap is increasing despite production gains and Marshall plan aid, according to the latest report to Congress by the Economic Cooperation Administration.

Not spelled out in that report but one reason why Europe wants to get more deeply into dollar markets for oil and other products to close that gap is the fact the world is getting smaller.

Trade between the countries of western Europe has recovered to prewar levels, but the iron curtain has cut the trade with eastern Europe to half of prewar. Our own trade with the soviet countries has been reduced to a mere trickle, too, but the United States is in better position to stand it than continental countries which traditionally looked to eastern Europe for raw materials and food.

The Marshall plan contemplates a big development of European markets by the elimination of trade barriers and is seeking to keep the development of refinery and other facilities to a level which will not result in surplus production that has to be thrown on the world market. So long as ERP continues the situation may be kept under control, but once the free flow of American dollars ceases there may be an economic set-back resulting in what might well be the stiffest competition American oil and other products have ever encountered in foreign trade.

How Big Is Too Big?

A new drive for legislation to regulate "big" business appears to be in the making at the Capitol.

A major subject of congressional discussion next year may well be: "How big is too big?" In other words, should corporations be permitted to grow to such stature that by reason of their financial strength alone they dominate entire industries.

Some members of Congress have long been worried over the continuous growth of corporations. Rep. Wright Patman of Texas several years ago sought to curb them with a bill providing for progressively increasing taxes on chain stores, and Sen. Joseph C. O'Mahoney of Wyoming has a different approach in his bill requiring corporations to take out federal charters.

Rep. Emanuel Celler of New York, chairman of the House judiciary committee, which currently is investigating the adequacy of the antitrust laws, is pushing the idea that corporations can become too big for the welfare of industry and has frequently suggested the possibility of a law patterned after the Public Utility Holding Company Act to force the reorganization of large companies into separate, independent units.

Either O'Mahoney's plan for federal charters or Celler's proposal would affect a dozen or more of the largest companies in the oil industry, but the latter is the more dangerous since it would accomplish by law what the Department of Justice has been attempting by suits (successfuly in the case of the motion picture industry)—divorcement of production from other branches of the major industries.

European Competition

Some loss in foreign markets is certain, but ECA will fight any overbuilding of Europe's refining capacity

Bertram F. Linz

WASHINGTON.—The European Recovery Program has helped to keep the American companies operating abroad in business, and the Economic Cooperation Administration has no intention of financing European refinery projects whose output can be sold only by resorting to discriminatory trade practices which would restrict the markets for American products.

These assuring statements were given to a House small business subcommittee last week by Oscar E. Bransky, acting chief of the ECA petroleum branch.

The subcommittee, headed by Rep. Eugene J. Keogh of New York, is studying the impact of imports on the domestic oil industry with particular reference at last week's hearing on the effect of the Marshall plan on domestic production and exports.

Bransky conceded that "the problem is largely one of American companies losing markets overseas because of a shortage of dollars, and those countries that have other local currencies are seeking to purchase oil with those currencies instead of dollars. Once you lose a market it is not so easy to recover it."

Market will shrink.—However, Bransky said, it is the hope of ECA that the loss of markets may be minimized, although he did not indicate what might be the outcome of the current Anglo-American talks on currency conversion and expanded markets for British oil. As projected by ECA, he explained, the American companies will have their share of world markets cut from 34 per cent in 1948 to 30 per cent in 1953, while the British share will drop from 54 to 48 per cent and that of all other countries will increase from 12 to 22 per cent.

But by 1953, he warned, the world surplus of crude and products may be much greater than it is today. Cornelius Dwyer, assistant chief of the petroleum branch, explained that in all probability this surplus would fall most heavily first upon the American companies' foreign operations, resulting in cutbacks in production and refinery throughput, but possibly still leaving them with surpluses to dispose of. He admitted the chances were they would have to look to the United States market for that disposal.

Bransky's direct testimony was chiefly a play-by-play exposition of the problems and actions of ECA. The adjustment of prices for Middle East crude purchased by the Marshall plan countries and the current efforts to revise the price structure on products were explained in detail, but the greatest emphasis was laid on the differences of opinion between the Organization for European Economic Cooperation and the ECA over the size of the Western European refinery program.

Showdown demanded.—Indicating that the negotiations had reached a critical state, Bransky told the subcommittee he was leaving for Paris at the end of the week to tell the OEEC it will have to make a downward revision in the program approved in October, calling for a total capacity in Europe by 1953 of 1,250,000 bbl. daily, plus 30,000 bbl. daily of in-bond refineries.

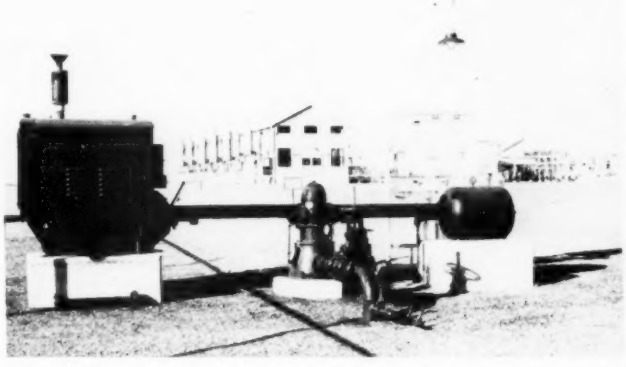
Bransky admitted that the Marshall-plan countries had gone ahead on their own with construction to give them a 1,010,000 bbl. daily capacity in the face of ECA's finding that 840,000 bbl. daily should be the first objective. He explained that Europe eventually will need all of the capacity contemplated but that ECA did not believe it should all be started at once. However, he added, the OEEC last spring put a stop order on the commencement of new refineries which would result in a level of capacity above 1,010,000 bbl. daily; that order was to run until October 1, but is still being complied with, he said.

"The petroleum-equipment program of the participating countries comprised two parts: The refinery expansion, drilling, and maintenance program in Europe itself, and the overseas expansion programs of the companies owned by nationals of participating countries," Bransky explained.

"The policy we adopted regarding the financing of overseas expansion was that we would finance such expansion only if the resulting new output was mainly needed in Europe for recovery; but not if the output was intended for export to third areas.

"We determined — and this is the cornerstone of our position—that we would not finance any expansion, whether in Europe or overseas, unless the resulting output could be sold without continued resort to currency discrimination, exclusive bilateral agreements, or other such arrangements."

Problem of "free" dollars.—ECA has no means of enforcing its programs—because the Marshall-plan countries can use "free" dollars for any project which it condemns—so there is a possibility that European nations



WATER FOR SURE.—With a water-circulation rate of 15,000 gal. per minute, the new North Pettus-Burnell cycling plant of Stanolind Oil & Gas Co. can take few chances on a supply shutdown, so it uses a special hookup at this water well. Normally the water is produced by an electrically driven submerged centrifugal pump. An auxiliary gas engine, however, is installed for use in the event of a power failure. Each of the two prime movers is connected to the pump through a covered horizontal shaft and universal couplings

might go ahead with refinery construction in that way and then seek ECA assistance for purchase of commodities which otherwise would be financed by the companies themselves. This, Bransky told the subcommittee, is one of the problems with which the ECA is wrestling.

Also coming into the picture are efforts on the part of ECA to induce the European countries to knock out quota systems, exchange controls, and other barriers to international trade which might be turned into weapons to freeze the American oil companies out of markets.

Keogh said the subcommittee hoped to have an interim report ready for the full committee shortly after Congress convenes in January, and expressed the opinion that by constantly hammering at the problem he believed the industry would be induced to work out a program of its own for dealing with the import problem.

WEST COAST

Cut-Production Plea

Continued Terminal Island subsidence causes Navy to plan abandonment; oil producers asked to cut output

Robert Harwick

LONG BEACH.—Oil producers in the Long Beach area have been asked to curtail production to avoid "sinking the Navy."

Because of the continual subsidence of Terminal Island—which is blamed on the extraction of oil and gas from beneath it—the Navy Department has ordered that its Long Beach Naval Shipyard be deactivated as of June 30, 1950.

To save this activity and its payroll for his home town, and pleading the needs of national defense, Congressman Clyde Doyle has written 124 producers in the area asking them to agree to curtail production by 30 per cent for a period of 6 months to see if this will keep the island from sinking further.

Producers reluctant.—To date, however, response from the producers has been meager. Representative Doyle accompanied his request with a letter from the assistant attorney general waiving prosecution under the antitrust laws for any concerted action taken by the oil producers to curtail production during the proposed test period.

But the producers say that such a waiver gives them no protection from prosecution by the 600 lease holders.

The Long Beach City Council has ordered production cut by 30 per cent on properties owned by the city. This involves chiefly operations by Long Beach Development Co. and Richfield Oil Corp. Some other producers in the area have also cut production voluntarily.

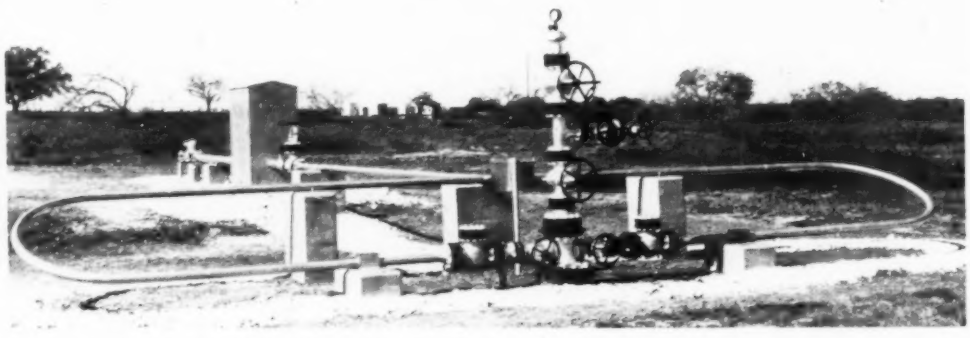
Typical of the producers' reaction is a letter sent Doyle by General Petroleum Corp. This reported that the company already has made a substantial reduction in the production of oil from the Long Beach area and plans further curtailment as rapidly as offset operations and contractual and legal operations will permit. But the letter added:

"Our action both heretofore and in the future in reducing production is not to be construed as part of any plan, concert of action, or test but is solely determined by us as consistent with good operating practices.

"We feel we should point out, however, that we do not accept the assumptions or claims that subsidence is caused by or contributed to by withdrawal of oil and gas. There is much technical information available which indicates other causes for the subsidence."

Underground slippage. — In addition to the sinking of the surface level, which has upset the foundations of a number of buildings in addition to the shipyard, the subsidence of the island has caused underground slippage which has broken the casing at a good many oil wells. As a remedy, a "bell hole" scheme was evolved by Long Beach Development Co. and is now being adopted by Union Pacific Railway for its adjoining property in Wilmington field.

This involves drilling a 30-in. hole for the first 2,000 ft. The casing will be held in the hole under tension and the annular space between casing and hole wall will be filled with mud sufficiently weighted and containing additives to provide a semiplastic mass.



CONSERVATION.—Typical of the growing number of gas-injection wells throughout Texas is the one above, one of several now operating in North Pettus and Burnell fields. Residue gas from Stanolind Oil & Gas Co.'s Pettus gasoline plant, which has a gas-processing capacity of 166,000,000 cu. ft. daily, is being returned to the producing formation. Union Producing Co. operates the cycling program. More than 70 miles of pipe connect the producing and injection wells with the gasoline plant. About 6,000,000 bbl. of 42°-gravity oil already have been produced from the two fields, and ultimate recovery is being greatly increased by the repressuring program. The project is typical of many in Texas, many of which have resulted from legislation controlling the disposal of residue gas

Smog Research

Oft-blamed petroleum industry now knows what it is; big job ahead is an all-out attempt to determine its source

Robert Harwick

LOS ANGELES.—The challenge of a difficult and unusual problem is holding the attention of the West Coast oil industry.

The problem is that of tracing minute particles of contaminating chemicals through 50 cubic miles of constantly moving air back to their source.

It is the next step in the oil industry's determined fight to find the source of "smog" in the Los Angeles area.

Charges unfounded.—It is an important fight because the oil industry, certainly without proven cause, has been singled out in the press, radio, and in public statements as being responsible for the blight. Refinery operations repeatedly have been blamed, and there have been occasions of patent distortion of fact in efforts to prove the petroleum industry at fault.

A difficult public-relations problem, and one unique in the oil and gas industry, has developed. Here is an area roughly 30 by 30 miles containing a population of 5,000,000, a great number of people, for want of a better explanation, believe the petroleum industry is the prime contributor to the gray clouds blown through city streets.

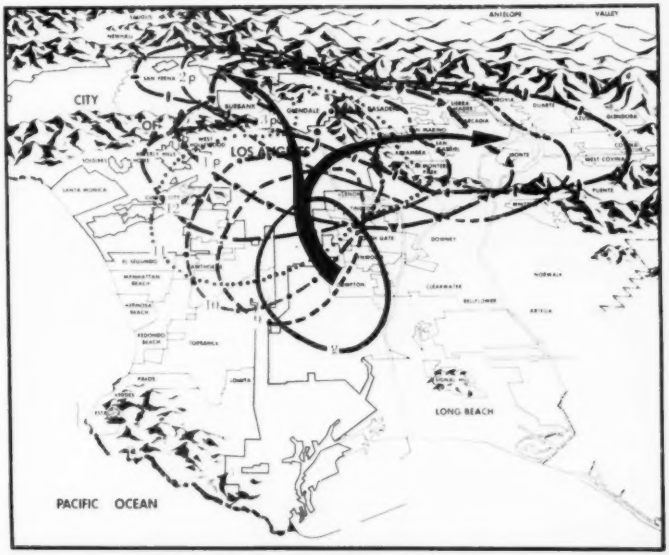
Within the past few years the West Coast oil industry has spent more than $10,000,000 on facilities to control or eliminate smoke and fumes. Two and a half years ago the Western Oil and Gas Association, representing about 90 per cent of the West Coast oil industry, retained Stanford Research Institute to help find the source of smog.

To date the results of $750,000 worth of research are far from conclusive, but the institute has learned a lot about smog.

It is not the mixture of smoke and fog found in other areas of the country. Rather, it is a complex mixture of gases and particulate matter mixed into the air, the institute reported to the association's smoke and fumes committee.

How it develops.—Geography, topography, and the phenomenon of temperature inversion play an important part in smog formation. The gases and particles collect under an upper layer of warm air. The layer is held on one side by mountains (see map) and on the other by winds from the ocean. When meteorological conditions hold the layer in place long enough, the various pollution elements pile up, or build down, until, through normal turbulence of the

Initial problem faced in the battle against smog was the development of means of, and instruments for, identifying and measuring its contents. Here Stanford Research Institute chemists analyze air at their sampling station on North Figueroa Street in Los Angeles. Their instruments, which are expected to have application in other parts of the country for determining air pollution, are, left to right, a freeze-out trap, an electrostatic precipitator, and an oil aerosol analyzer



Map of the Los Angeles area showing the pattern of eye-irritating smog movement throughout the day. Figures alone represent morning hours, those followed by "p." afternoon

air, they are swept along the earth's surface.

Some 40 foreign substances have been found in the atmosphere. The most prominent percentagewise are sulfur dioxide, ammonia, filterable oil, ozone, oxides of nitrogen, fibers, carbon, and pollen.

Tests prove that none of these, alone and in the quantities measured, causes irritation. However, there is a piling-up effect whereby several of the compounds produce eye irritation similar to that experienced during smog days.

Possibly the strangest thing noted so far is the presence of large amounts of ozone. During smog periods the concentration of ozone will be as much as 10 times that found on clear days. Just what relation this powerful oxidation agent bears to the occurrence of smog is now a subject of investigation by the institute.

Source important.—While as yet no attempt has been made to trace the known contaminants to their source, the attempt will be made as the next necessary move before determining what, if any, and where, steps must be taken.

The oil industry is proud of its "good industrial manners," according to W. L. Stewart, Jr., executive vice president of Union Oil Co., who is chairman of the smoke and fumes committee.

"Our performance in these matters has generally been for better—voluntarily—than is required by the laws of the cities, countries, and states in which we operate.

"We know that this research project is the most comprehensive ever undertaken anywhere in an effort to solve the smog problem. . . ."

What has been done.—Discussing the individual efforts of oil companies in the cooperative effort to clear itself of blame for the condition, Stewart said:

"We have designed, built, and installed equipment for the separation and disposition of hydrogen sulfide, to control vapors and fumes other than hydrogen sulfide, to control dust, eliminate smoke at boiler plants and other units, to dispose of acid sludge and to reduce the emission of other possible air contaminants.

"Into these projects went the best engineering skills in existence today. They have not eliminated smog. We thought they might help.

"What expenditures will eventually be necessary by our industry, other industries, and in nonindustrial activities of the people of the Los Angeles area to control smog, no one yet knows."

When the questions are finally answered, Stewart believes it will be largely due to the kind of work now being done by the oil industry through the research institute.

MID-CONTINENT

Construction under way at site of new fluid catalytic cracking unit at Deep Rock's refinery. Regenerator is under construction at right; gin-pole derrick and foundation for main fractionator may be seen in left foreground

Modernization

Deep Rock refinery project now 25 per cent complete

CUSHING, Okla.—Work on Deep Rock Oil Corp.'s modernization program is now more than 25 per cent complete after 6 months of site clearing and preliminary construction.

The over-all program includes a fluid catalytic cracking unit, complete with feed-preparation and gas-concentration facilities, crude topping unit, other new processing facilities, new research and development laboratory, and office building.

The modernization program is aimed both at improving refinery operating efficiency and providing high octane cracking capacity to meet the fuel requirements of future internal combustion engines.

Rating on the new catalytic cracking unit ranges from 5,000 to 6,000 bbl. daily depending on type of feed stock and method of operation. An existing polymerization plant will be revamped for processing gas from the cat cracker.

Refinery staff members are now receiving training in the different phases of the new processing scheme which is scheduled to be placed in operation about mid-year 1950.

Construction reports this week show that processing equipment is being installed. Jones & Laughlin Supply Co., the prime contractor for the Cushing project, has installed heavy-duty hoisting equipment for erecting various vessels and other items, including sections of some of the larger vessels which, because of their size, will be field assembled. A number of smaller vessels, the gas-plant absorber and several receivers, are now in place on their concrete footings. Foundations are also complete for the main fractionator and cat unit's 160-ft. regenerator-reactor.

New Look

The new appearance of The Oil and Gas Journal's news pages is but one phase of a program to make it easier for the busy reader to grasp the essential features of the week's oil news quickly.

News items are grouped under geographic and topical headings, and the entire news section is presented in a modern, fast-moving journalistic style which, without sacrificing technical accuracy, gives the highlights and significance in the shortest possible time.

Particular attention is given to reporting news developments of an operating and technical nature, presenting them in a semitechnical news fashion. Detailed articles on engineering and technical phases of the industry will continue to be presented in the engineering section of the Journal.

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LATIN AMERICA

De Mares Decision

Tropical tells Colombian Government it wants no part of concession ownership, might stay on as operator

Dahl M. Duff

TROPICAL OIL CO. has notified the Colombian Government that it is not interested in participation in its De Mares concession after August 25, 1951, when the property reverts to the government.

The company's announcement was a major development in the efforts of government authorities to work out some acceptable method for operating the concession after expiration of the 30-year Tropical contract.

Tropical's recent statement is interpreted as not ruling out the possibility of some kind of management of operating agreement between the government and the company. However, it means Tropical has decided against any degree of ownership after the expiration date.

Output declining.—De Mares, producing 32,378 bbl. daily of crude oil in September, is Colombia's most important area, though the fields are in a declining condition. Last December, the Colombian Congress in Law 165 authorized creation of Cia. Nacional de Petroleos as the company to take over reverted oil concessions. Fifty-one per cent of the stock to be held by the government or by Colombian nationals.

This plan of interesting foreign capital into a minority position in the mixed-company setup has thus far not been successful. Some officials had hopes that Tropical would be attracted into the project.

As far as is known, no other foreign company of major size has indicated any interest in sharing in participation in De Mares after the expiration date. Furthermore, private Colombian capital appears to be reluctant to invest in the enterprise. Most industrial investments generally pay at least 12 per cent return, and nothing of this nature is foreseen from De Mares, particularly in view of the various taxes now levied on the industry.

First to expire.—De Mares is considered to be the first major oil operation to revert to a government by normal expiration of a concession. Tropical, organized by Benedum & Trees interests, brought in the discovery in 1918. The company was sold to International Petroleum Co., Ltd., an affiliate of Standard Oil Co. (N.J.), in 1920. The concession was for a 30-year term, and the date of first exploitation was subsequently fixed as August 21, 1921, when Tropical began intensive development work.

All property of all kinds, including the 22,500-bbl. refinery on the concession, will be acquired by the government on the expiration date in 1951. Tropical will continue its marketing operations and also its exploration activities elsewhere in the country.

Jose Elias del Hierro, the minister of petroleum, and Lionel W. Wiedey, Tropical manager, recently signed an agreement providing an orderly and gradual assumption of control in De Mares by the government. A commission with one government and one company representative was created. Its functions include seeing that normal operations and maintenance are continued and cooperating with the government's National Petroleum Council in the solution of any labor problems that may arise.

The agreement also provides that the company will gradually shift management to Colombian nationals, retaining its freedom of action during the period. An earlier arrangement whereby the government exercises control over the movement and removal of all equipment in the concession continues in force.

REBUILT REFINERY.—This is a view of the reconstructed refinery of the Deutsche Shell Co. about 10 miles from Hamburg on the River Elbe in Germany. The plant shortly after the war was given up as a total loss since it had been a priority target for Allied air attack. Plans were made to rebuild in 1946 and it was recently reopened. When the reconstruction work began, more than 150 unexploded bombs were on the site, and nearly 500,000 cu. ft. of debris had to be cleared. The completed refinery has facilities for topping, vacuum distillation, dewaxing, and furfural extraction; its design called for an intake of 435,000 tons of crude per year (about 9,000 bbl. daily)

Colombian Strike

Magdalena Valley wildcat tests 800 bbl. of oil daily

TEXAS PETROLEUM CO.'s wildcat Tetuan 1, in the upper Magdalena Valley near the town of Ortega, has shown production at a rate of about 800 bbl. daily in preliminary tests.

The apparent success of the well has created considerable excitement in Colombia, which has been confronted with a sharp decline in exploratory activities over the last year.

If further testing and drilling shows a field discovery, Tetuan 1 will be the first commercial wildcat success since the same company brought in its Velasquez discovery late in 1946. In addition, it would encourage further exploration over a wide area of the upper Magdalena Valley.

Total depth of the well is 4,579 ft., and 5½-in. casing is set at 4,300 ft. Gravity of the oil is 22 -23 . The location places the well southwest of

MIDDLE FRIO SAND IN WEST COLUMBIA FIELD BRAZORIA COUNTY, TEXAS

Mud (Aquagel and Phosphate): R_m = 1.00 ohm at BHT
Bit Size: 9⅞"
Spacings: AM = 16"
AM' = 63"
AO = 19'

This is another in a series of interpreted electrical logs from identified formations and fields which Schlumberger will reproduce in this publication. If you would like to keep this entire series, please write to us on your letterhead and we will be glad to send you a reprint of this log (and preceding logs in this series) with a binder in which you may file subsequent logs as they are published. This series is made possible through the courtesy and cooperation of the oil operators who have released these logs.

6

LOG ANALYSIS

1) Water saturation S

At water level $R_o = 0.3$ ohms

At level A, $S = \sqrt{\frac{.3}{21}} = 12\%$ approx.

2) Formation water resistivity R_w

$SP = -70 \log_{10} \frac{R_m}{R_w} = -90$ mv.,

thus, $R_w = 0.05$ ohm at BHT

3) Porosity p

$F = \frac{R_o}{R_w} = \frac{0.3}{0.05} = 6$

$p = \sqrt[m]{\frac{1}{F}} = 30\%$ for $m = 1.5$

CORE ANALYSIS

Average Porosity	30%
Average Permeability	1000 md.
Residual water	45%

Connate water determined by restored state methods 10-12%

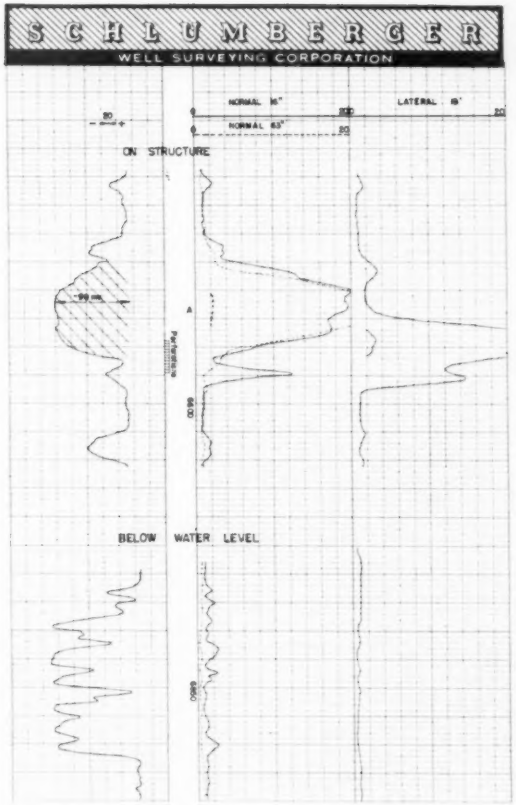
PRODUCTION RESULTS

Perforated: 6581-6594

Initial Production: 97 bbls. per day 30° API

Gas oil ratio: 4400/1

Gas increasing with time.



SCHLUMBERGER
WELL SURVEYING CORP.
HOUSTON, TEXAS

Bogota and about 550 miles from the Caribbean up the Magdalena.

In an interview in Bogota, N. Bower, Texas Petroleum manager, pointed out that these early results must be treated with caution. He mentioned that the low gravity of the oil and its distance from tidewater makes necessary considerable additional drilling before the discovery can be appraised from a commercial standpoint.

Texas Petroleum's only present production in Colombia is at Velasquez, approximately 150 miles down the river from the new Tetuan well. Texaco's interest in the Barco concession is held jointly with Socony-Vacuum Oil Co., Inc. In Velasquez, Texas Petroleum has three producing wells and is now drilling Velasquez 7.

Colombian sources said the Tetuan discovery also represents a legal success. The Tolima Department has numerous ranches on private property. Difficulty of clearing these claims has hampered previous exploration in the region. The Tetuan well is the first drilled on a government concession of 49,687 hectares (about 123,000 acres) granted in August 1947. The Tetuan well was spudded in June of this year.

Paraguay Search Ends

LOS ANGELES.—Union Oil Co. has served notice on the Paraguay Government that it is forfeiting its agreement under which the company has conducted exploration and drilling activities in the country.

This brings to a close some 5 years of effort by Union, both in negotiating with the Paraguay Government and in field activity. Considerable exploration work has been done and five test wells drilled. None was productive.

While this doesn't disprove the presence of petroleum deposits in Paraguay, the company feels that present world conditions do not warrant further expenditures in this area.

To date the project has cost the company slightly more than $7,500,000. The agreement called for Union to maintain a string of tools in operation. These and other surplus equipment are now being disposed of in Paraguay by company representatives.

Mexican Exports Higher

Exports of crude oil and products by Mexico the first 9 months of 1949 were at a rate slightly in excess of last year's figure.

Exports totaled 9,421,524 bbl. for the first 9 months. This is approximately 34,600 bbl. daily. Exports last year totaled 12,097,901 bbl. for a daily average of about 33,000 bbl. daily. In 1947, Mexico exported 14,507,535 bbl., averaging about 39,700 bbl. daily.

Of the first 9 months exports, 5,303,942 bbl. consisted of crude oil, and 2,920,526 bbl. was fuel oil. Gasoline totaled 233,199 bbl., and gas oil, 963,937 bbl.

Of the total, the United States received 5,533,778 bbl. or approximately 59 per cent. Next largest importer of Mexican petroleum was Cuba with 1,179,995 bbl. Holland took 927,720 bbl. Other destinations and amounts were: British West Indies, 376,447 bbl.; Canary Islands, 64,309 bbl.; Dutch West Indies, 350,388 bbl.; United Kingdom, 435,271 bbl.; Italy, 212,745 bbl.; Sweden, 193,791 bbl.; and Yugoslavia, 147,080 bbl.

Creole October Output Up

Creole Petroleum Corp.'s operated production in Venezuela increased nearly 25,000 bbl. daily from September to October but the number of rigs in operation showed a further slight decline.

Creole's output in October averaged 637,240 bbl. daily. Runs at Caripito averaged 68,826 bbl. daily, and at La Salina, 17,451 bbl. daily.

EUROPE

German Success

Well proves Emsland area's first stratigraphic trap

ANOTHER discovery has been made in the Emsland area of Germany near the Dutch border. The well, 1 Scheerhorn of C. Deilmann Bergbau G.m.b.H., on production test flowed 72 cu. m. (about 450 bbl. daily) through a 6-mm. choke.

The well is located on the joint concession of C. Deilmann, Gewerkschaft Elwerath, Preussag, and Wintershall, A.G. It is slightly less than 2 miles north of Georgsdorf field and about 2.2 miles southwest of Adorf field.

Of particular interest is the fact that the Scheerhorn oil comes from a stratigraphic trap, a type of structure not previously found in the Emsland. The Scheerhorn well encountered the normal Emsland horizon (Bentheim sandstone) at 3,670 ft. The production test followed a Schlumberger test which indicated oil formation between 3,630 and 3,680 ft.

Gewerkschaft Elwerath also has obtained new production at 3,940 ft. under the old and slightly productive shallow wells at Kuhlenberg near Nienhagen in the Hannover area of Northwest Germany.

The new well, Kuhlenberg 2 flowed as much as 168 tons over a period of several days from the overburden of the salt dome in the Wealden (Lower Cretaceous). It is expected to provide about 20 tons (approximately 140 bbl.) daily under restricted conditions.

In the Emsland area, another producer has been added to the new Ruehlertwist field. Ruehlertwist 4 found oil at 2,640-2,755 ft. It is located about a mile west of the discovery and about a mile from the Dutch border.

Acidizing has given a marked improvement in the flow from Dalum-Nord 1 of Deutsche Schachtbau-und Tiefbohrges, m.b.H., about a mile north of the Lingen-Dalum field in the Emsland. Flow was 78 cu. m. (about 490 bbl.) daily after acid treatment. The well is important as a 6,000-ft. northeast extension of the field and also as the first important production from the Apt formation in the Emsland.

Rig for Portugal

A German drilling rig is now being assembled near Lisbon for use in the oil exploration program in Portugal.

The rig was supplied by Preussische Bergwerks & Huetten-Aktiengessellschaft. The same firm last August sent a crew of 10 to Portugal.

Cia. do Petroles de Portugal has been doing preliminary exploration in Portugal. The company, with ownership about equally divided between the Portuguese Government and Swedish interests, holds concession rights over about a fourth of the country.

Plant for Scotland

WASHINGTON.—The Economic Cooperation Administration announced last week that it has approved construction of a petroleum chemicals plant at Grangemouth, Scotland, at a cost of $17,000,000 toward which it will grant $6,500,000 to cover engineering fees and services and the purchase of special equipment in this country.

The plant is to be built for British Petroleum Chemicals, Ltd., for the production of ethyl alcohol and isopropyl alcohol, and will be located adjacent to the Anglo-Iranian Oil Co. refinery, which will supply the raw materials. Anglo-Iranian and Distillers Co., Ltd., are joint owners of the new plant and will provide funds for the remainder of the construction cost and the local currency to match the FCA grant.

Spanish Well at 5,000 Ft.

The wildcat test of Cia. de Investigaciones y Exploraciones Petroliferas, S. A., in northern Spain is drilling ahead below 4,936 ft. The well was reported in fine, dark shale at that depth. The test is in Soria Province about a mile south of Burgo de Osma township. The company is owned equally by Socony-Vacuum Oil Co., Inc., and Cia. Espanola de Petroleos, S. A. (Cepsa).

Takes New Job

Nelson manager of crude supply for Standard (Ind.)

R. E. NELSON, JR., has been appointed general manager of products pipe lines and crude-oil supply for Standard Oil Co. (Ind.), Chicago, and will be responsible for keeping crude flowing into the firm's refinery at Whiting, Ind.

Since June, Nelson has been serving as assistant to J. L. Burke, president of Stanolind Pipe Line Co., Tulsa, subsidiary of Indiana Standard. A graduate of the University of Missouri with a degree in geology, Nelson joined Stanolind Oil & Gas Co., producing subsidiary of Indiana Standard, in 1931 as a geological scout at Midland and Pampa, Tex.

In 1935 Nelson was moved to Houston as landman, and in 1937 was transferred to Amarillo, Tex., as district landman. Later serving as assistant division landman at Fort Worth, Nelson was transferred to the exploration division's general offices in Houston in 1943. In May 1946 he was named unitization superintendent, and in 1947 was given the post of executive assistant to the director of producing and manufacturing.

In 1948 Nelson became division manager of the Texas-Louisiana-Gulf Coast region, with headquarters in Houston. Prior to his affiliation with the Indiana Standard group, Nelson was with Sinclair Oil Corp. and Dixie Oil Co.

Bruce C. Clardy has resigned as general manager of products pipe lines and crude-oil supply for Standard Oil Co. (Ind.) and will return to Texas to resume activities as an independent oil operator. **R. E. Nelson, Jr.,** assistant to the president of Stanolind Pipe Line Co., Tulsa, was named to succeed Clardy at Indiana Standard. Clardy served as regional manager of the War Production Board's conservation division and as chief of the pipe-line operations section, Petroleum Administration for War, during World War II. Prior to joining Indiana Standard, he was with Heard & Clardy, Inc., Dallas drilling contractors.

BRUCE C. CLARDY

W. J. Lang has joined Sinclair Oil & Gas Co., Tulsa, as senior geologist. He formerly was with Stanolind Oil & Gas Co. in Fort Worth. Other changes in Sinclair's production department include: **Lawrence C. Stratton,** district superintendent at Drumright, Okla., named assistant division superintendent at Fort Worth; **Kenneth E. Thornton,** district foreman at Pampa, Tex., moved to Drumright to succeed Stratton as district superintendent; **William J. Rogers,** senior engineer at Arp, Tex., named division engineer at Fort Worth; and **John W. Hemphill,** senior engineer at Kiefer, Okla., named division engineer at Independence, Kans.

N. van Wingen, vice president of Petroleum Technologists, Inc., Montebello, Calif., has been elected chairman of the Pacific Petroleum Chapter, American Institute of Mining and Metallurgical Engineers.

C. F. Firmin has been appointed assistant chief engineer for Ohio Oil Co.'s pipe-line department, Findlay, Ohio, and **Clare McElhinny** has been appointed assistant division superintendent of the Wyoming pipe-line division. Firmin is a graduate of Case Institute of Technology, and joined Ohio Oil in 1933 at Findlay. He has served in the refinery-engineering department and as engineer in the pipe-line department. McElhinny formerly was superintendent of the Greybull, Wyo., district and prior to that was district superintendent at Lance Creek, Wyo. He has been with the company's pipe-line department since 1922. **E. E. Phillips,** assistant superintendent of the Greybull district, will succeed McElhinny as superintendent there. He has been with the firm since 1928.

W. B. Cunningham, drilling superintendent for Jones-Shelburne, Inc., at Russell, Kans., has been transferred in a similar capacity to Ada, Okla.

Hines H. Baker, president, Humble Oil & Refining Co.; **J. R. Parten,** president, Woodley Petroleum Co.; and **Wesley W. West,** independent oil operator, all of Houston, were recently appointed members of the Houston Advisory Committee of University of Texas Development Board.

William E. Kennett, district geologist for Superior Oil Co. at Paso Robles, Calif., is now serving as geological supervisor at Los Angeles, with jurisdiction over the Pacific division.

W. F. Dunning, marine-department manager for Standard-Vacuum Oil Co. since 1934, will retire January 1 after more than 40 years of service in that field. He will be succeeded by **J. M. B. Howard,** previously assistant manager.

Albert S. Munneke has been appointed Oklahoma area engineer for Stanolind Pipe Line Co., with headquarters in Shawnee. For the past 3 years Munneke has been serving as a corrosion engineer and previously served as electrical engineer. From 1942 to 1944 he was on leave of absence to the War Emergency Pipe Line, where he was in charge of electrical-station design, and supervised electrical construction for the entire system. **Ross M. Lewallen,** Tulsa, has been appointed telephone and telegraph foreman of the Kansas division, with headquarters in Humboldt.

A. S. MUNNEKE

George L. Nelson, production foreman for Magnolia Petroleum Co., in the Brownfield district of West Texas, has been made assistant district superintendent of that area. **Herman A. Hanks** was transferred from Pampa to the Brownfield district as production foreman. In the company's natural-gas department, **George D. McClelland** has been promoted from an engineering assignment in the Dallas offices to plant foreman of the Chitwood gasoline plant at Duncan, Okla. **Charles E. Freeman** was also promoted from an engineering assignment in the construction and maintenance section to plant foreman in the Sholem-Alechem gasoline plant at Healdton, Okla.

W. D. Heath Eves has been appointed representative of the Anglo-Iranian Oil Co. in the United States. He joined the company shortly after the

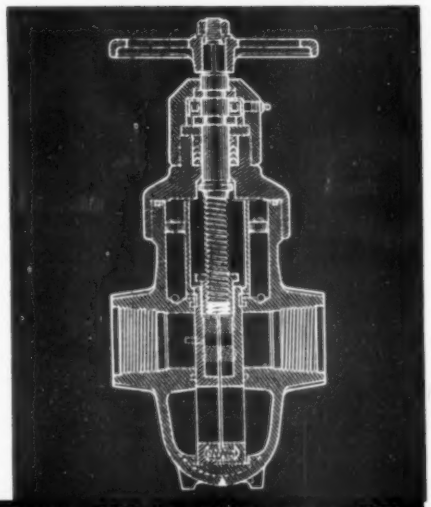
HERE THEY ARE!

The 500 and 1000 lb. W.O.G.

McEvoy

AUTOMATIC LUBRICATION

CONDUIT GATE VALVES



Here are the "little brothers" of the famous high pressure McEvoy valves. They offer all the advantages . . . long life, easy opening and positive sealing . . . of the high pressure valves — yet they are competitive in price to other lower pressure valves.

Be sure to specify McEvoy the next time you order 500 or 1000 lb. valves. You can be sure you are getting the best in valve service.

SPECIFICATIONS—500 lb. working pressure—1000 lbs. test pressure, 1000 lb. working pressure—2000 lbs. test pressure. McEVOY AUTOMATIC LUBRICATION GATE VALVE.

DIMENSION	2" 500-lb. W.O.G.	2" 1000-lb. W.O.G.	2 1/2" 500-lb. W.O.G.	2 1/2" 1000-lb. W.O.G.	3" 500-lb. W.O.G.	3" 1000-lb. W.O.G.
End-to-end measurement	7-3/4"	7-3/4"	10"	10"	10-7/8"	10-7/8"
Floor to center of port	5-5/16"	5-5/16"	6-3/4"	6-3/4"	7-3/4"	7-3/4"
Center of port to top rim of handwheel	10-3/4"	11-1/2"	12-3/16"	12-3/16"	13-1/16"	13-13/16"
Diameter of handwheel	7-1/2"	8"	7-1/2"	12"	8"	11-1/4"
Minimum diameter of opening through valve	2-1/16"	2-1/16"	2-9/16"	2-9/16"	3-1/8"	3-1/8"

This is a two-way valve. It functions perfectly in any position with either end upstream.

McEvoy COMPANY

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Export Representative: E. F. Gahan, Inc., Room 1223, 500 Fifth Avenue, New York, N. Y.

war, during which time he served in the Royal Navy. He was assigned to the New York office 1½ years ago and has been in charge since **B. R. Jackson,** his predecessor, returned to England in April to take his seat on the board of the Anglo-Iranian Oil Co.

A. E. PECORE

A. E. Pecore has been named general superintendent of Humble Pipe Line Co., Houston, and eight other major appointments have been made by the firm in a reassignment of duties. **F. D. McMahon** has been appointed superintendent of the company's West Texas division, with headquarters at Midland; **Jack Jones** has been named superintendent of field operations of the entire company; **H. M. Stevenson** has become manager of planning and economics; **C. H. Lundt** has been given the position of chief engineer; **P. D. Phillips**

C. H. LUNDT

JACK JONES

has become assistant chief engineer; **C. C. Moore** has been named coordinator of personnel and policy; **L. E. Grissom** is now secretary and superintendent of oil movements; and **E. L. Krueger** has been named assistant secretary and assistant treasurer. Pecore joined the company as draftsman in 1919, and has served as assistant civil engineer and assistant chief engineer. He was named chief engineer in 1945. McMahon has been with the firm 30 years, and has served as division superintendent and assistant general superintendent of field operations. Jones joined the company in 1928 and has been serving as assistant division superintendent at Midland since 1941. Stevenson, with the firm since 1920, has been assistant general superintendent, engineering and development. Lundt joined Humble Pipe Line 26 years ago and most recently has been assistant chief engineer. Phillips started with the company in 1934 and has recently been serving as supervising mechanical engineer. Moore joined the firm in 1920 and became personnel coordinator in 1942, and Grissom is a 30-year man with

P. D. PHILLIPS

F. D. McMAHON

the company, and has been serving recently as secretary and assistant treasurer. Krueger has been with Humble since 1923, and has served as assistant to the treasurer since 1946.

Everett T. Crumley, independent oil operator, Cut Bank, Mont., has been elected Montana state president of Independent Petroleum Association of America, succeeding **M. R. Wagner,** Cut Bank independent operator, who resigned, but who remains a director. The following have been confirmed as new directors: **J. A. Oien,** Kevin, Mont.; **Ted Hawley,** Conrad, Mont.; **Ross Svare** and **M. E. Porter,** both of Shelby, Mont.; **William S. Croft** and **G. S. Frary,** both of Cut Bank; **Victor S. Day,** Sunburst, Mont.; **Byron Holt,** Havre, Mont.; **Ed L. Allen,** Lewiston, Mont.; and **Henry Magee** and **Levi Burd,** both of Browning, Mont.

Earl C. Cockrum, geologist for Carter Oil Co. at Purcell, Okla., has been transferred to the firm's geological department at Mattoon, Ill.

R. B. Anderson, Vernon, Tex., president of Texas Mid-Continent Oil and Gas Association, has been elected chairman of the Texas State Board of Education.

William H. Pinckard, now president of Bahrein Petroleum Co., Ltd., and California Texas Oil Co., Ltd., has been advanced to chairman of the board of directors and chief executive officer of the Bahrein-Caltex group. **William F. Bramstedt,** director and executive vice president, will become president of the group, and **H. M. Herron,** now chairman of the board, will continue as a director and chairman of the executive committee. Pinckard, president since 1946, started in the oil business in 1917 and after several months at the Port Arthur, Tex., refinery, was transferred to the Philippines. He subsequently

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W. H. PINCKARD

© Bachrach

W. B. BRAMSTEDT

held positions in China, Australia, and India. Bramstedt, formerly with Standard Oil Co. of California, has been concerned entirely with foreign operations since 1946 and was president of Mid-East Crude Sales Co., Ltd., before his election as executive vice president.

Earle C. Flesher, Johnson & Flesher Drilling Co., Oklahoma City, has been reelected chairman of the Oklahoma City chapter, American Association of Oilwell Drilling Contractors. Others reelected include: **Jack Abernathy,** Big Chief Drilling Co., vice chair-

Top officials of the Sinclair companies snapped in Tulsa on a visit to operations in the Mid-Continent this week. Left to right: H. L. Phillips, president, Sinclair Oil & Gas Co., New York; J. W. Jordan, vice president, Sinclair Oil & Gas Co., Tulsa; William L. Connelly, chairman of the board, Sinclair Oil & Gas Co., Tulsa; J. P. Walsh, general counsel, Sinclair Oil Corp., New York; P. C. Spencer, president, Sinclair Oil Corp., New York; L. V. Stanford, president, Sinclair Petroleum Co. and vice president of Sinclair Refining Co., New York; and P. W. Thirtle, controller, Sinclair Oil Corp., New York

PERSONALS

man; and **W. R. Ewert,** Kerr-McGee Oil Industries, Inc., secretary-treasurer.

Paul E. Busch, formerly with Great Lakes Pipe Line Co. at Kansas City, Mo., is now assistant superintendent of the measurement department, Texas-Eastern Transmission Corp., with headquarters at Shreveport.

W. S. ZEHRUNG

W. S. Zehrung, president of the Pennzoil Co., Oil City, Pa., has been elected a vice president of South Penn Oil Co. by the board of directors. He will be in charge of refining and marketing for the firm, which controls the Pennzoil Co. Zehrung has been a director of South Penn for several years.

DR. JERRY McAFEE

Dr. Jerry McAfee, chemical engineer for Gulf Oil Corp. at Port Arthur, Tex., has been named director of the chemical division of Gulf Research & Development Co., Harmarville, Pa., and will take up his new duties on January 1. He succeeds **Eugene Ayres,** who will become technical assistant to **Dr. Paul D. Foote,** executive vice president of Gulf. McAfee, who joined Gulf in 1945, has a B.S. degree in chemical engineering from University of Texas. Formerly with Universal Oil Products Co., he also holds a Doctor of Science degree in chemical engineering from Massachusetts Institute of Technology.

G. F. McMillan, Denver, district manager of Gulf Oil Corp., has been named chairman of the Rocky Mountain Oil Industry Information Committee, succeeding **Paul Hirth,** of Continental Oil Co.

R. L. Walker has been named scout and landman for Champlin Refining Co. in the Permian basin area, with headquarters in Midland, Tex. He formerly was assistant district landman in the area for Continental Oil Co.

Vernon Bottoms, Midland, Tex., has joined **L. H. Armer,** independent oil operator of Fort Worth, as manager of the Armer district office for West Texas at Midland. He will direct all land, geological, drilling, and production operations for the firm in the Permian basin. He was formerly district engineer for Superior Oil Co. of California.

James M. Charlton, with Standard Oil Co. of Texas for the past 25 years, has retired from the company at Houston, but will remain in the industry as an independent.

Frank D. Gardner, field representative for Sinclair Oil & Gas Co., has been named president of the Permian Basin Crude Oil Scouts Association. Other officers of the association are: **Tracy Medders,** Shell Oil Co., named vice president, succeeding **R. L. McCormick,** of Magnolia Petroleum Co., who was made secretary-editor; and **Lawrence B. Berry,** Shell Oil Co., reelected treasurer. Gardner replaces **T. M. Smith,** of Shell Oil Co., who has been named director from the association to the National Oil Scouts and Landmen's Association.

Lorenz Schock, National Geophysical Co., Midland, Tex., is serving as temporary chairman of the newly organized Permian Basin Geophysical Society. Serving as temporary secretary is **Winn Payne,** Pure Oil Co., Midland. The group has approximately 130 members and is one of the largest affiliated sections of Society of Exploration Geophysics.

SHIFTS—

William J. Rogers, engineer, Sinclair Oil & Gas Co., Arp, Tex., to Fort Worth; **Frank T. Lloyd,** engineer, Richfield Oil Corp., Bakersfield to Alhambra, Calif.; **Clyde L. Caldwell,** engineer, Union Oil Co. of California, Long Beach to Oakland, Calif.; **Don E. Evert,** engineer, Union Oil Co. of California, Long Beach to Whittier, Calif.; **Dale M. Strasser,** engineer, The Texas Co., Long Beach to Whittier, Calif.; **L. S. Chambers,** engineer, Seaboard Oil Co. of Delaware, Los Angeles to Pasadena, Calif.

DEATHS

R. P. Bascom, formerly president of Shell Pipe Line Corp., died November 22 in Los Angeles. He retired from the company in 1940 after completing 22 years of service. His first position was acting manager at Tulsa in 1918.

John C. Pankow, Detroit Michigan Stove Co., chairman of the newly formed National Committee for L. P. Gas Promotion, died December 1. He was a member of N.G.A.A. and L. P. Gas Association.

C. R. Eller, former station engineer for Shell Pipe Line Corp. at Basile, La., died recently.

Dr. J. J. Deaner, 69, Tulsa independent oil operator, died December 5. He opened the Deaner oil pool in Okfuskee County, Oklahoma, in the early 1923's.

Daniel Fred Martin, 83, retired head of land and lease operations for Standard Oil Co. of California in southern California, died recently.

P. J. (Jack) Radke, 55, owner and operator of Radke Oil Field Supply, died in Pawhuska, Okla., November 29.

L. E. Roberts, 50, Tulsa, formerly with the old Roxanna Oil Co. and later with Unit Rig & Equipment Co., died November 28.

Carter Standard Cole, assistant technical secretary, American Society for Testing Materials, died in Philadelphia recently. He had been on A.S.T.M.'s staff since 1944.

Don Wynn Crosby, Houston independent oil operator, died November 29.

George O. Mitchell, 49, superintendent of Sun Oil Co.'s land and tax department at Beaumont, Tex., died November 29.

Frederick Joseph Ossenbeck, 72, former Tulsa independent oil operator, died in St. Joseph, Mo., December 2.

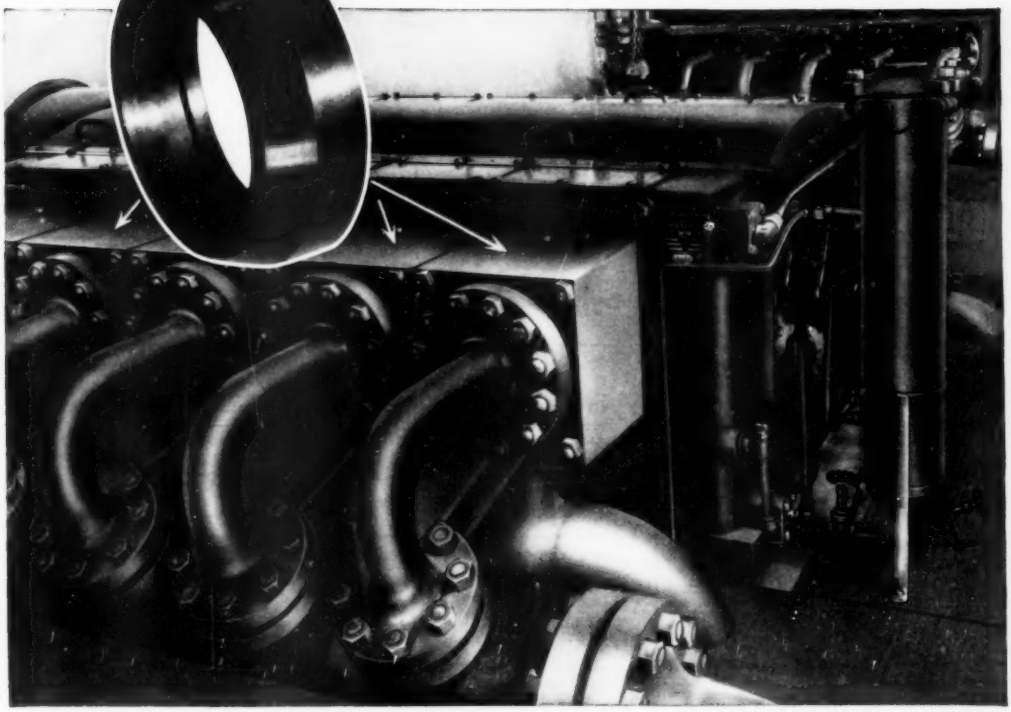
Bobby Ross Francis, 25, well serviceer for Superior Oil Co., died November 27 in Colorado City, Tex.

Ben W. Traugh, 74, Tulsa, retired oil driller in the Mid-Continent area, died December 5.

Carl Fisher, former independent oil operator, died in Wichita November 30. He formerly was president of Derby Oil Co.

William N. Davis, 76, former vice president, director, and member of the executive committee of Phillips Petroleum Co., Bartlesville, Okla., died December 5 in Summit, N. J. He lived in Bartlesville from 1924 to 1937.

← *Packing molded by The Castle Rubber Co., East Butler, Pa.*



Cooper-Bessemer "Twin Line" high pressure liquid pump.

Packing that can take a beating . . . yet fight off oil, too!

LOSS of pressure and leakage of packing lubricant is a common "pump problem", especially where high pressure is involved. But that problem, along with other headaches, was solved in the revolutionary "Twin Line" high pressure liquid pump pictured here. For one of this pump's important features is a well designed plunger sealing ring or packing molded from a Hycar American rubber compound.

These pumps are used wherever liquid is pumped against high pressure—for example, in oil pipe lines, in descaling service in steel mills and in many other fields. The plunger sealing ring, under these severe service conditions, must possess extreme oil and abrasion resistance, low compression set, and excellent aging properties. That's why Hycar was chosen.

Pressure is maintained and lubricant leakage is prevented because the Hycar packing provides lip-type contact with the pump plunger in two directions. The plunger travels at terrific speeds. When operating, one lip of the Hycar packing seals against the pump discharge pressure. The other lip seals against inward leakage of the packing lubricant.

Hycar
Reg. U. S. Pat. Off.
American Rubber

This packing is another example of a tough problem solved because of the unusual combination of properties which Hycar provides. For Hycar resists oil, gas, heat, weather, and wear—and Hycar compounds have excellent resistance to flow under high pressures.

Versatile Hycar may be just what you need to improve or develop a product—to solve a problem—and bring more sales dollars *your* way. It is used as a base material . . . as a plasticizer for polyvinyl resins . . . as a modifier for phenolic resins . . . as an adhesive base . . . as a latex for coating or impregnating. Write for information. Please address Dept. HE-13. B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

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GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

. . . its application

by J. A. Pellettere*

THIS discussion is aimed to show the fundamentals considered in sizing control valves, and in selecting plug design from the standpoint of so-called flow characteristics, without employing complicated mathematics. So far as possible, examples of applications are taken from actual experience of the author and others rather than hypothetical cases.

Control-valve applications may be classified in three groups, as follows:

Group 1. Wherein the valve is the load and the pressure drop across it is substantially constant at all rates of throughput.

Group 2. Here the valve is a part of the load and usually only a minor part, since it is in series with a major unit which comprises the primary load. Pressure drop across the valve varies with the throughput rate.

Group 3. In this case the control output from the primary instrument operates through an auxiliary device, such as a steam-turbine governor or gas-engine carburetor mechanism. Here the "auxiliary device" is the control valve, or takes the place of the control valve, and is located external to the fluid stream. In one sense, the control valve constitutes none of the load.

No formulas, charts, or slide rules are needed in determining valve sizes. Material of this sort for a particular valve is available from the manufacturer. Neither are any data required on valve flow characteristics, since these too are given in most valve catalogs—shown usually as a plot of per cent capacity vs. per cent lift. The important point in the manufacturer's charts, sometimes overlooked, is that constant pressure drop is assumed for all stem positions; in practice, however, the valve is often called on to operate with a pressure drop which varies as the valve stem moves. Another point is that at the instant a change occurs in pressure

*Instrument engineer, Gulf Oil Corp., Pittsburgh. Summary of paper given at the 1949 Petroleum mechanical engineering conference of the American Society of Mechanical Engineers, Oklahoma City.

GROUP 1

In this group the valve is the load; recommended valve-plug characteristic is linear.

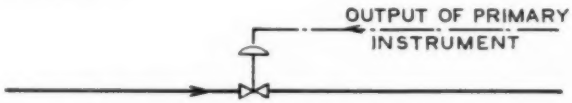


Fig. 1—Valve is alone and operated by output of primary instrument

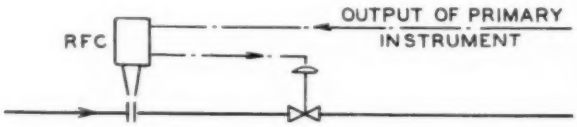


Fig. 2A

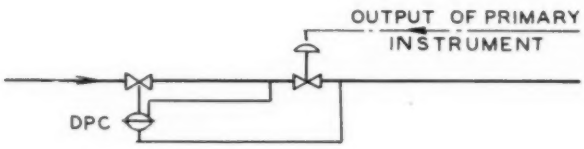


Fig. 2B

Valve is operated by flow controller which is pneumatically set by primary instrument

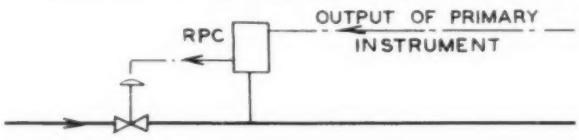


Fig. 3A

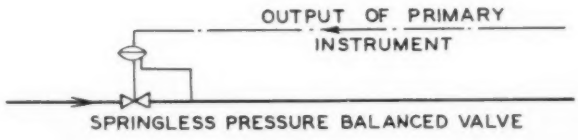


Fig. 3B

Valve is operated by pressure controller, pneumatically set by primary instrument

GROUP 2

In this group the valve is part of the load; recommended drop varies with the throughput rate; recommended valve-plug characteristic is logarithmic.

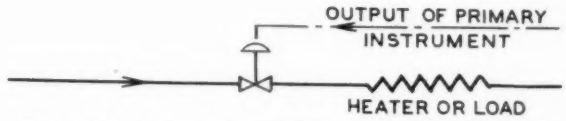


Fig. 4—Valve is alone and operated by output of primary instrument

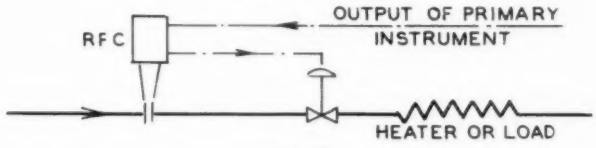


Fig. 5A

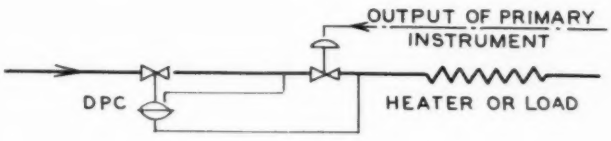


Fig. 5B

Valve is operated by flow controller which is pneumatically set by primary instrument

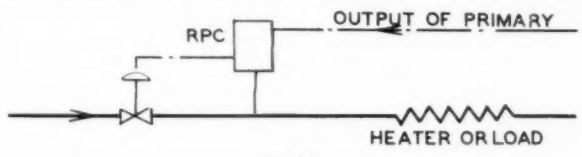


Fig. 6A

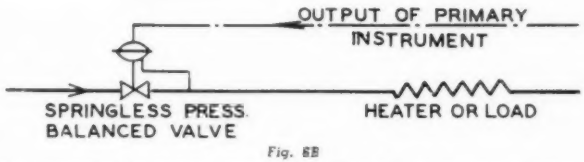


Fig. 6B

Valve is operated by pressure controller, pneumatically set by primary instrument

drop, there is a corresponding change in flow capacity.

There are two basic valve-plug types. These are referred to here as linear and logarithmic. The linear type produces a flow capacity approximately proportional to per cent lift, whereas the logarithmic gives a lower flow capacity at intermediate positions; for example 15 per cent at 50 per cent lift. The logarithmic plug is so designed that the per cent change in flow per unit change in lift is substantially constant.

The simple pressure reducing station, commonly used in steam or gas service is shown in Fig. 1. The valve absorbs the pressure drop and operates at constant pressure-loss condition. The economy in such an installation is obviously unimportant and rangeability is as good as the valve itself. In general, pressure control may be obtained easily due to stored capacities which are favorable in most cases. The characteristic curve of a control valve for constant pressure-drop conditions should be of the linear type.

In Fig. 2A the valve is shown operating in connection with a flow controller. The flow controller, Fig. 2B, is commonly used in steam-generating plants. This hookup shows a differential pressure-control valve employed to maintain constant pressure drop across the instrument-operated main control valve. The conventional pneumatically set pressure controller operated from the primary instrument is shown in Fig. 3A. This is not a common arrangement. A more economical method for obtaining the same result when pressures are relatively low, is frequently employed in gas-firing systems. The pressure-balanced fuel valve, which is springless, receives impulses from the primary instrument and maintains a low side pressure in fixed ratio to the pressure loading from the instrument.

When a reset flow controller is used as indicated in Fig. 2A, the rangeability of the system is determined by the rangeability of the orifice, and maximum flow is determined by the orifice plate provided the valve is of suitable size. The characteristics of a valve, when operated in connection with a pneumatically set orifice-type flow controller, is believed really not important unless the flow meter is of the delayed long-transmission type. Because of resultant lags in such instances preference is shown for a linear-type valve.

In a case such as Fig. 2B, however, the size and characteristic of the control valve is highly important. The valve curve should be linear, and its maximum orifice will determine maximum flow, assuming that there is always sufficient pressure available for the differential pressure-control valve to function as intended.

Pressure Controller

Where the valve is operated by a pneumatically set pressure controller as in Fig. 3A, again the belief is that the plug characteristic is relatively unimportant unless the pressure control itself is hampered by extremely bad lags, when a linear valve is employed. The same is true for the springless pressure-balanced valve Fig. 3B.

In general, for all installations where the control valve is the only load and the pressure drop is substantially constant, a linear plug characteristic is the proper one to choose although where a secondary pneumatically set instrument aids the valve, a logarithmic plug will usually perform just as well.

When a load is added in series with the control valve (Fig. 4), a different analysis is necessary. The hookups in Figs. 5A, 5B, 6A, and 6B are duplicates of those shown in Figs. 2A, 2B, 3A, and 3B except for the addition of the series load.

Obviously the pressure drop across the control valve (Fig. 4) must be variable, and that it will be higher at low flow rates and lower at high flow rates, if the entire system pressure loss is approximately constant as is usually the case. The pressure drop absorbed by the load varies with the flow (by the square-root law); at high rates of flow more pressure drop is absorbed than at low rates. The control valve must "eat up" the rest of the available system pressure loss, since it is the only variable orifice

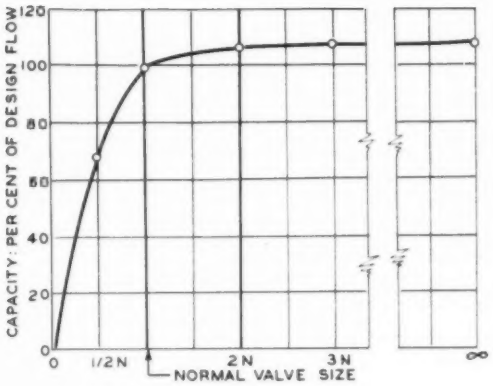


Fig. 7—Valve size vs. capacity

VALVE SIZE	VALVE LOSS	"R" LOSS	FLOW RATE
1/2 NORMAL	$\frac{15}{.52} = 60\ \%$	40 %	$\frac{\sqrt{40}}{\sqrt{85}} = 68.5\ \%$
NORMAL	$\frac{15}{12} = 15\ \%$	85 %	$\frac{\sqrt{85}}{\sqrt{85}} = 100\ \%$
2 X NORMAL	$\frac{15}{22} = 3.75\ \%$	96.25 %	$\frac{\sqrt{96.25}}{\sqrt{85}} = 106.4\ \%$
3 X NORMAL	$\frac{15}{32} = 1.66\ \%$	98.34 %	$\frac{\sqrt{98.35}}{\sqrt{85}} = 107.6\ \%$
INFINITELY LARGE	$\frac{15}{\infty} = 0\ \%$	100 %	$\frac{\sqrt{100}}{\sqrt{85}} = 108.5\ \%$

Fig. 9—If "normal" size control valve absorbs 15 per cent of total available head loss from A to B at design flow when valve is 100 per cent open, then other valve sizes in the same service will limit flow as above

in the system. Therefore, the lower the flow rate in general, the higher the pressure drop across the control valve, and vice versa. This condition makes the "characteristic curve" for the control valve (which is based on constant pressure drop) practically useless. When, considering that for a given stem position other than full open, the valve orifice must be smaller for a logarithmic than for a linear valve, it seems apparent that the logarithmic plug must be the one to choose. General practice bears out this statement.

There is one exception, however, as illustrated in Fig. 2B wherein the control valve plug should be linear, since a way is provided here for maintaining a constant pressure drop across it. The D.P.C. valve is the one which has the variable drop in this case and it should therefore have a logarithmic plug.

In sizing the control valve by the method given here more work is involved than when using valve manufacturer's sizing charts, because the entire flow system must be considered; and sometimes it even may be found that an infinitely large valve is indicated. Fig. 7 shows that in a typical series-load problem, increasing the size of the control valve will increase only slightly the system capacity. Considering here (Fig. 8) a fixed supply pressure and a fixed back pressure, leaving a constant head loss to be absorbed by the control valve plus the fixed resistance. The size of a "normal" control valve is defined as the size which absorbs 15 per cent of available head loss at design flow when the valve is wide open. A 2 x normal valve would be twice as large (in port area) and therefore at the same pressure drop would pass double the flow rate of the normal valve.

Fig. 9 shows the division in available pressure drop between the valve and the load "R" for various valve sizes, when the valve is wide open. The maximum flow rate or capacity is expressed as a per cent of design flow. Note that a 2 x normal valve does not produce a capacity of 200 per cent but only about 106 per cent and that even an infinite valve will allow a flow of only 108.5 per cent of normal.

This is obviously not the fault of the valve. The only way to push more flow through the system is to increase the supply pressure or reduce the back pressure. The logical time to do this is when the system is being designed. The equipment engineer should work closely with the instrument engineer if satisfactory control is to be obtained. Pressure-drop calculations must be accurate. This is not always an easy thing to accomplish, but an error may leave so little pressure drop for the control valve that desired control is impossible regardless of valve size.

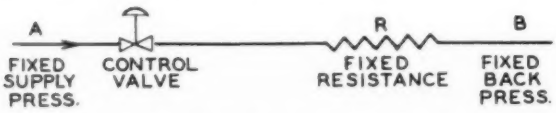


Fig. 8—Effect of control-valve size on system flow capacity

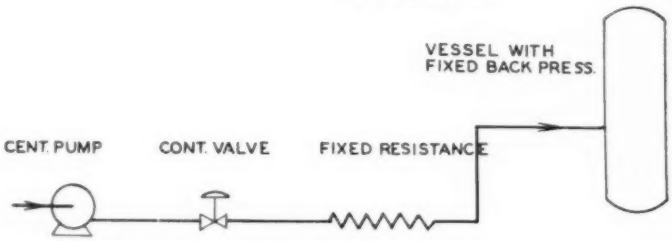


Fig. 10—Behavior of control valve under varying flow rates

The maximum peak flow rate must be agreed on; if 106 per cent of design is sufficient, then 15 per cent of the system loss at design flow must be allotted to the control valve when a 2 x normal valve is used. If more than 6 per cent over design flow is necessary for short periods, then more than 15 per cent of the available pressure drop must be assigned for the control valve. Calculations similar to those in Fig. 9 will give the amount of excess head needed.

Another application of the principles outlined herein is illustrated in Fig. 10. This may be considered as a boiler feed-water system wherein the vessel represents the boiler drum. The control valve may be actuated by the drum level controller. The fixed resistance would be all (exclusive of the valve) other losses in the system. Actually the pump may supply more than one drum, each with its own level controller, valve, and fixed resistance, all of which do not affect the basic analysis. This study again shows that the control valve must absorb the difference between the pump head and all other pressure losses at any one flow condition. As in any series-load problem, if the rangeability is to be high, then the percentage loss across the valve must be high also.

The graph, Fig. 11, illustrates the point that maximum obtainable flow is primarily a function of pump-head

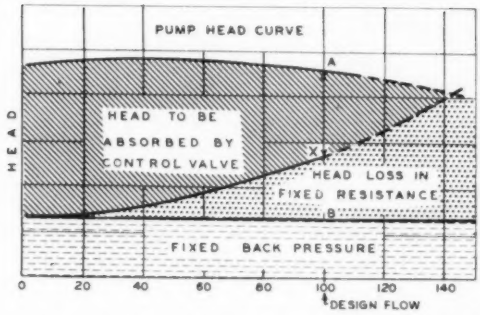


Fig. 11—At design flow the head loss "AX" must be absorbed by any control valve selected. If the pump-head design is such that AX is 15 per cent of AB, the net dynamic loss, then the maximum flow obtainable is approximately 106.4 per cent of design flow when using two times normal value. The maximum flow obtainable is primarily a function of pump-head design, which will establish the ratio AX/AB. If pump is selected so that AX is 50 per cent of AB, even an infinite value will allow only 141 per cent of design flow

design. Maximum flow cannot exceed the point of intersection of the pump-head curve with the curve of fixed resistance head loss, regardless of valve size. If at design flow the valve absorbs one-half the available pressure loss, then maximum flow cannot be more than $\sqrt{2}$ times design flow, or about 141 per cent of normal, and in actual practice must be somewhat less than this since the control valve will always show some pressure drop.

In any circuit where a control valve and a fixed load are in series, the engineer when specifying equipment must take into consideration sufficient head to overcome pressure drop requirements of the fixed load at maximum flow, plus that for the control valve as established by the instrument engineer.

Of course installations of the foregoing type are not generally of a high order of economy, since at capacities below maximum a substantial portion of energy is wasted as pressure loss through the control valve. The only way to avoid this loss is to remove the control valve from the fluid stream altogether and at the same time provide a means of varying the energy input as needed. The diagrams, Figs. 12, 13, and 14, show some of the ways this can be done.

In Fig. 12, the governor takes the place of the control valve. The steam turbine or gas engine is of sufficient horsepower to meet any peak demand required, yet operates efficiently at reduced loads. Thus we have the necessary reserve power without the waste of energy through the control valve at lower speeds as in Figs. 4, 8, and 10. In Fig. 13 the same thing is accomplished for a fan by controlling the suction with vanes; an unloader or an air compressor is another commonly used device.

A situation frequently encountered which illustrates one reason why we cannot merely dispense with all Group 2 types of control and arbitrarily use one of Group 3 methods is illustrated in Fig. 12C. If the pump discharge (Fig. 12C) must be split into two or more streams and each one controlled, the control valves must be in the discharge lines.

Fig. 14 shows a method for varying pump speed when the driver speed will not allow a high turn-down range. An a.c. motor, for example, will operate economically over a wide range of loads at constant speed; so a modulated coupling between driver and driven is employed to provide the speed variation required. The instrument-operated electric or hydraulic clutches may not be commercially available today, but the advantages are obvious and they may become common where high rangeability and high economy are required simultaneously with the use of a constant-speed driver.

GROUP 3

In this group the control output from primary instrument operates through auxiliary device.

D-DRIVER P-PUMP C-COUPLING V-VANES
G-GOVERNOR E-ENERGY SUPPLY

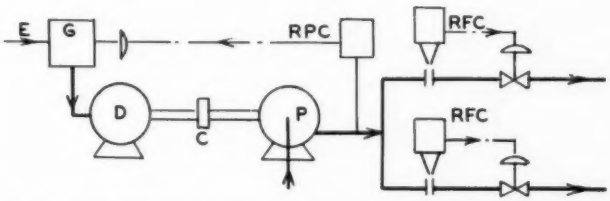


Fig. 12—Output of primary instrument operates governor to vary energy output—(a) with steam-turbine driver, and (b) with gas-engine driver

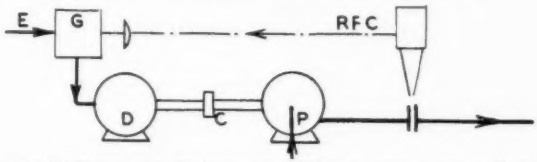


Fig. 12A—Addition of split discharge often results in Group 2 type of flow control with its undesirable loss in flow circuit

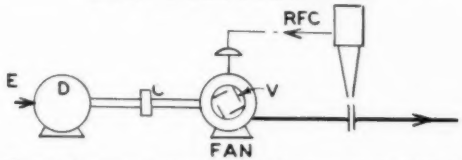


Fig. 13—Output of primary instrument controls pump suction—fan inlet vanes

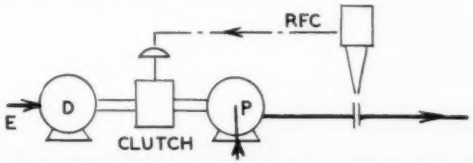


Fig. 14—Output of primary instrument operates automatic clutch. Driver is constant-speed type a.c. motor or two-stroke gas engine—(a) electric clutch, (b) hydraulic clutch

Crude-Oil Flow Characteristics Experienced in Large-Diameter Lines

by Lowell E. Anderson*

WITH the advent of larger-size lines for crude-oil transportation, the question has arisen as to the flow characteristics encountered therein. The term large diameter is a comparative one but in this discussion will refer to lines with outside diameters of 16 in. and larger. The increased laying of larger lines has paralleled the development of higher-strength steel, permitting higher station operating pressures, together with improved methods of laying line.

A further parallel has been the increased use of technical data for the design of new systems rather than rules of thumb formerly used. Since the pumping rates through these larger lines are much greater, the need for an accurate knowledge of available throughput is gaining in importance so that the optimum size line will be used in the design of new facilities and the length of loops required to enlarge on present facilities can be accurately determined.

In hydraulic calculations involving crude oil, it has been found that the basic formula as introduced by Darcy in 1857 is the most applicable of the various flow formulas. In its basic form the equation is solvable if the various quantities are expressed in foot-pound-second units giving the value of hf in feet. This form is rather cumbersome, however, as units required in the basic equation are not commonly used in pipe-line terminology. This equation, after conversion to a more practical form, can be expressed as:

$$P = \frac{34.87\ fB^2s}{D^5} \qquad (1)$$

where each of the terms has the following significance:

P = pressure drop, psi. per mile
B = line throughput, bbl. per hour
s = specific gravity of oil pumped
D = internal diameter, in.
f = friction factor

In this equation it is possible physically to measure all quantities with the exception of the dimensionless friction factor which must be determined experimentally.

The customary means of expressing f is to plot its value against the corresponding value of Reynolds number, R, which is in existence in the line at that particular time. It is not necessary to dwell at length on this number as it also is familiar to all engineers. In its basic form it is expressed as:

$$R = \frac{dv\rho}{\mu} \qquad (2)$$

where:

d = diameter of pipe
v = velocity of fluid
ρ = density of fluid
μ = absolute viscosity

Any consistent set of units can be used such that the value of R will be dimensionless. This equation can also be expressed in a form more readily used and remembered by engineers. This converted form is:

$$R = \frac{2{,}214 \times B}{D \times \nu} \qquad (3)$$

where B and D have the same significance as set out above and ν is the kinematic viscosity of the oil moving through the line, expressed in centistokes. To further clarify the formula, the relationship between centistokes and Saybolt Universal seconds, a more common way of expressing viscosity, can be set forth by a simple equation:

$$\text{centistokes} = 0.22t - 180/t \qquad (4)$$

where t represents Saybolt Universal seconds.

A basic relationship between f and R has been established for streamline flow and verified by many experimenters so will be valid for the lines here investigated. This relationship can be expressed by the equation $f = 64/R$ which when substituted in Equation 1 gives:

$$P = \frac{1.008\ B}{D^5\mu} \qquad (5)$$

where μ is the absolute viscosity in centipoises.

Experimental work by Stanton and Pannell on fluid flow through pipes embraced a wide set of flow conditions. The experiments were carried out using air and water moving at different rates through smooth drawn brass pipe varying in diameter from 0.361 to 2.855 cm. The curve propounded by these authors is shown in Fig. 1. This shows the two distinct regions of flow, streamline and turbulent.

It is the purpose here to describe tests run recently for the evaluation of the friction factor "f" in large-diameter lines in the turbulent-flow region and to express the results obtained from these tests. The intent in carrying out this investigation was to secure data that would be of direct use in hydraulic calculations on commercial pipe lines rather than

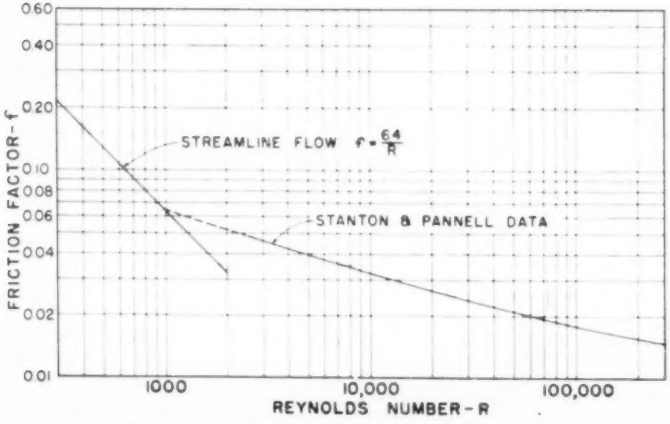
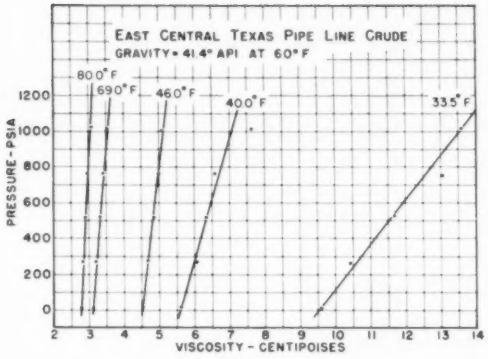


Fig. 1—Crude-oil flow characteristics experienced in large-diameter lines

*Stanolind Pipe Line Co., Tulsa. Presented at the 1949 Petroleum Mechanical Engineering Conference of the American Society of Mechanical Engineers, Oklahoma City.



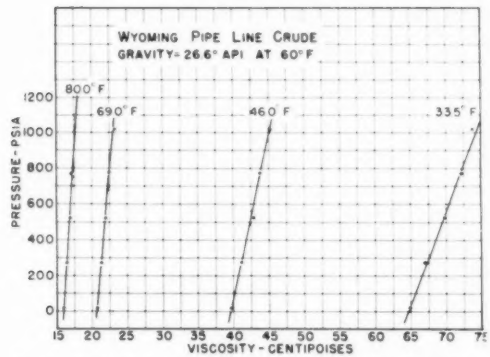


Fig. 2—Crude-oil flow characteristics experienced in large-diameter lines

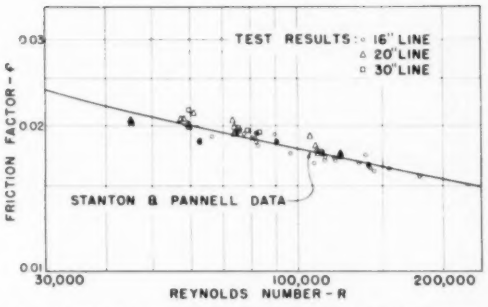


Fig. 3—Crude-oil flow characteristics experienced in large-diameter lines

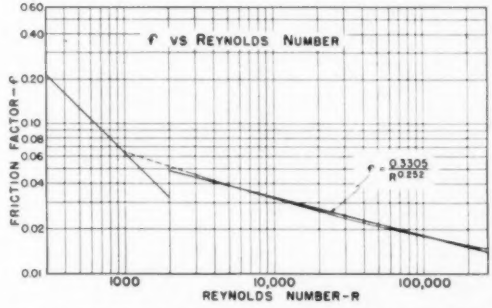


Fig. 4—Crude-oil flow characteristics experienced in large-diameter lines

procuring data that would be of academic interest only.

Numerous papers such as that of Stanton and Pannell have been written on the value of f as determined by laboratory experimentation, using various fluids such as water and air in small-diameter lines. Our purpose was to determine which data, if any, obtained from these laboratory experiments would be confirmed by results secured from large-diameter lines moving crude oil. Various authors concur with the reasoning that their results obtained from smaller lines may not hold true for larger lines.

To get information such as was desired, sections of line in our system were utilized as test sections, thus providing the best large-scale laboratory possible. The friction factor was determined in each of a series of test runs on each section of line. This was done by using Equation 1, measuring the four quantities, P, s, B, and D and solving for the unknown friction factor. To measure the pressure drop, P, recording pressure gages were normally used. One was installed at each end of the test section of line and calibrated in place by means of a dead-weight tester.

For the measurement of specific gravity, periodic samples were taken from the line and the gravity determined by means of a hydrometer. The gravities of the crude in the lines varied from 32° to 44° A.P.I. An accurate measurement of the volume of oil pumped through the line is necessary in order to obtain the pumping rate, B. The most desirable method is to pump decrease out of one tank so that the actual volume can be determined from hourly tank gages. If this procedure is not possible, meter readings may be used if such an installation is available, providing the meter has been recently calibrated and its accuracy assured.

The internal diameter used is the nominal internal diameter of the line with no allowance being made for manufacturing tolerances. Just prior to the running of a test, a pig-type scraper was run through the line to remove any wall deposits which would have the effect of reducing the internal diameter, which would in turn give a higher value for the calculated friction factor.

To compute the value of R to correlate with the value of f, it is necessary to determine the viscosity of the oil being pumped, this value then being used in Equation 3. The ordinary method of measuring viscosity is by use of a commercial viscosimeter, such as the Saybolt Universal type of instrument, which measures the time of efflux of a prescribed amount of liquid through a calibrated orifice. However, these tests run at atmospheric pressure do not give the true viscosity of the oil while moving through the line under pressure. It was known that viscosity increased with pressure, but a perusal of available literature on the subject yielded nothing that was specific enough to be applicable for our use. The effect of pressure on viscosity is gaining in importance due to the trend towards higher operating pressures.

To obtain information on conditions existent in our system, tests were run to determine how viscosity varied with pressures normally encountered in pipe-line operation. Fig. 2 shows the results obtained from two crudes analyzed in this manner by means of a falling ball type of viscosimeter. The East Central Texas crude is one of the lightest common stream crudes handled in our system and the Wyoming crude is the heaviest common stream crude moved through our lines. An examination of Fig. 2 shows that the relationship between pressure and viscosity is apparently a straight line function.

At higher temperatures, the per cent increase in absolute viscosity per 1,000 psi. is about the same for the two crudes, but at lower temperatures the effect of pressure is much greater on the lighter crude than on the heavier Wyoming crude. Also, for either of the particular crudes, the increase in viscosity due to increased pressure is a greater percentage at lower temperatures. From the trend indicated on the curves, it appears that if the temperature is increased sufficiently, there may be a point at which pressure will have no effect on viscosity. However, this supposition would have to be proved or disproved by actual tests.

It is obvious now that using viscosity determined at atmospheric pressure by means of commercial viscosimeters will give erroneous values. With this added information, our problem now is to seek to utilize this information in a simple manner. As realized from past experimentation and evidenced by this investigation, the science of turbulent flow is not an exact one such as is experienced under streamline flow conditions. Instead, the basic equation includes the empirical term f which is dependent on many variables and which will itself vary over a certain range for the same type of pipe.

Because of the inability of quantitatively measuring f, it is proposed to make its value dependent on one more variable—the change in viscosity due to pressure. Since the operating pressure of most trunk-line stations do not vary widely, this effect

will be a fairly consistent one so it is proposed not to use a viscosity correction factor, but instead to plot the values of f determined against the apparent value of R. The apparent value of R will be the value of this term based on the viscosity determined at atmospheric pressure.

Although the effect of viscosity change in turbulent flow is an indirect one, by reference to Equation 5, it is seen that in streamline flow the pressure drop is directly proportional to the absolute viscosity, so using the correct viscosity is of major importance. Normally, crude-oil flow is in the turbulent region, but there are cases where streamline flow is encountered such as in winter months in lines moving the heavy Wyoming oil shown in Fig. 2. Since pressure vs. viscosity gives a straight line, the viscosity determined at atmospheric pressure can be corrected by using a correction factor based on the average line pressure.

It is difficult to determine the average line pressure exactly due to ground profiles being very irregular but for most cases, the average line pressure in a section of line can be assumed to be one-half the station discharge pressure. No investigation has been made into streamline flow in actual operation to determine how closely theoretical conditions will be approximated.

As a counteraction to the effect of pressure on viscosity, some crudes are of a thixotropic nature, i.e., their apparent viscosity decreases as the shear rate increases. The shear rate in any one size line would increase as the pumping rate increases. This characteristic is noticed especially in high-paraffin-base crudes such as those produced in southwestern Wyoming. On one pipe-line system operating in this area, normal operating pressures as high as 2,000 psi. are encountered, thus resulting in a larger throughput and a corresponding high shear rate. In expressing the viscosities of these crudes, viscosities determined by an efflux type viscosimeter will give a false indication of the viscosity of the oil moving through the line. Instead, a viscosity-temperature curve should be used showing apparent viscosities determined from a study of actual operations.

The Brookfield type of viscosimeter, which measures the resistance of liquid offers to a rotating cylinder, simulates actual shearing conditions so should come close to presenting the true viscosity of the oil at atmospheric pressure. Most crude oils are of the Newtonian type, however, as their apparent viscosity at any certain temperature is constant regardless of shear rate. For this type of crude, a normal temperature-viscosity curve as determined by means of an efflux viscosimeter can be used for determining uncorrected line viscosities.

The section of the Stanton and Pannell f vs. R curve between Reynolds number of 30,000 and 240,000 has been reproduced in Fig. 3 and the writer's experimentally determined values for f have been plotted against the apparent R. As shown on the graph, these points were calculated from tests run on lines of 16, 20, and 30 in. diameter. An examination of the graph shows that the writer's points determined from the 16-in. lines approximate the Stanton and Pannell curve very closely. The average of the points from the 20-in line fall slightly above the curve and the three points representing the 30-in. line are still higher above the curve.

The values of f from the 16 and 20-in. diameter lines were determined in all cases from sections of trunk line many miles in length, which in most cases included very few valves and no junctions, making the values representative of straight pipe. Much of the 16-in. line has been in West Texas sour crude service for a period of over 5 years. The 20-in. sections tested have been used for both sour and sweet crude and have been in service from 1 to 2 years.

The values shown for the 30-in. diameter line were obtained from a section of tank line approximately ½ mile in length. This line was just recently laid and is used for sour West Texas crude. Because of its short length and corresponding small pressure drop, it was necessary to measure the pressure differential by means of a manometer installed at each end of the line. Due to insufficient data on the 30-in. line, no definite conclusions can be reached but it is felt that in trunk-line service, the friction factor for this size line will be somewhat lower than shown here.

The 30-in. tank line tested was ¼-in. wall pipe and was laid aboveground so was probably not perfectly round as the pressure in the line did not exceed 15 psi. In addition, the test section included an expansion joint which would have the effect of increasing the pressure drop slightly, resulting in a higher apparent friction factor.

Moody has drawn a family of friction-factor curves on different relative roughness. The lowest curve in this family is for smooth pipe and approximates the Stanton and Pannell curve. The relative roughness, ϵ/D, as given by Moody for commercial steel pipe in the range of sizes here discussed is low enough that it can be considered as smooth pipe in the range of Reynolds numbers normally encountered.

Drew, Koo, and McAdams made a survey of work done on determination of the friction factor to ascertain if Lee's equation, which was based on the data of Stanton and Pannell, gave values for f that were representative of smooth pipe. Their investigation showed that the majority of experimental work, up to a Reynolds number of 500,000, validated Lee's equation. These authors also studied work done on commercial iron and steel pipe and as a result of this study presented a curve for f somewhat higher than that for smooth pipes. The work they reviewed was all carried out on small-diameter pipe and they state that smaller size pipes generally give higher values for f.

Other experimental work has been done by Heltzel at lower Reynolds numbers on lines 6 to 12 in. in diameter in crude-oil service and the validity of the Stanton and Pannell curve for this use has been verified by him. It is believed the test data accumulated here is sufficient confirmation of this curve to warrant using it for large-diameter lines. Although these tests did not cover the entire range of R encountered in these lines, the range covered includes the majority of normal flow conditions. Because the Stanton and Pannell curve has thus been substantiated for a wide range of pipe sizes, an expedient equation based on this curve will be developed for determining directly trunk-line capacity.

The use of Equation 1 for determining line capacity is rather laborious as it is necessary to use a cut-and-try method for determining the value of f to use in the equation. The range of R normally encountered in our crude-oil lines does not exceed 200,000 with the majority of flow conditions giving a value of R less than 100,000. Our problem now is to develop a relationship between f and R which will give fairly consistent results over the entire range of turbulent flow conditions encountered in our work. To do this, a straight line is drawn between points on the Stanton and Pannell curve corresponding to R of 6,000 and 130,000 as shown in Fig. 4. It can be seen that this straight line does not vary widely from the curve at any point. By simple mathematics, the equation of this line is calculated to be:

$$f = \frac{0.3305}{R^{0.202}} \qquad (6)$$

but

$$R = \frac{2{,}214 \times B}{D \times \epsilon}$$

which substituted in Equation 6 gives:

$$f = \frac{0.0474\ D^{0.202}\ \epsilon^{0.202}}{B^{0.202}} \qquad (7)$$

This in turn is substituted in Equation 1 and the resultant form is:

$$P = 1.653\ \frac{B^{1.798}}{D^{4.798}}\ \epsilon^{0.202} s \qquad (8)$$

Solving this equation for B gives the following:

$$B = \frac{0.750\ P^{0.552} \times D^{2.596}}{\epsilon^{0.101} \times s^{0.552}} \qquad (9)$$

While this is unwieldy to use, it does give a direct means of solving for the capacity of a line. The greatest value of this type of equation lies in its adaptability to logarithmic charts or a logarithmic slide rule, providing a convenient means of solution.

It is felt that the choice of the straight line for v vs. R above the Stanton and Pannell curve will approximate actual conditions very closely as the use of a higher friction factor will give a greater pressure drop than encountered in a straight pipe line. This higher pressure will compensate for certain factors not now considered which have the effect of increasing the operating pressure.

(Continued on page 84)

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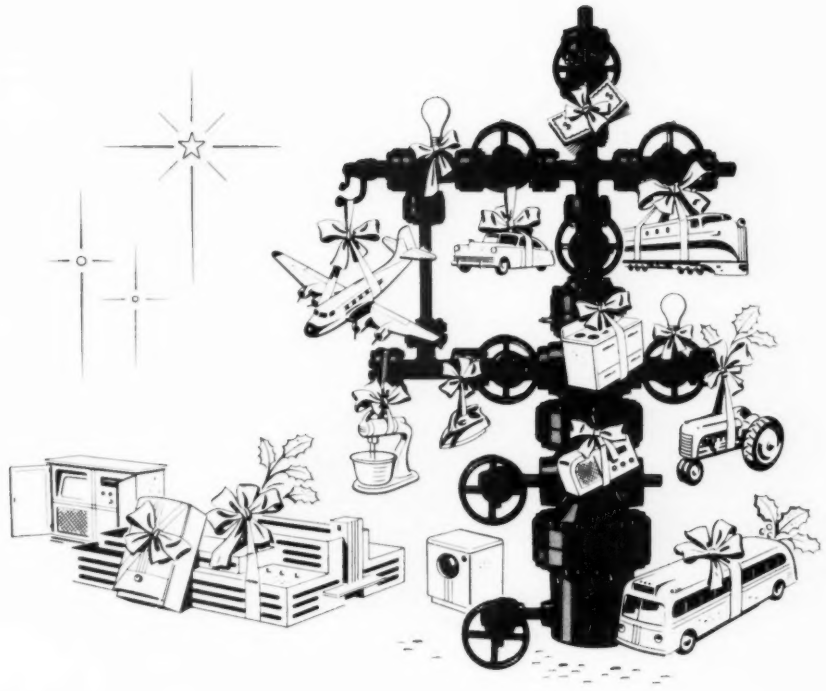

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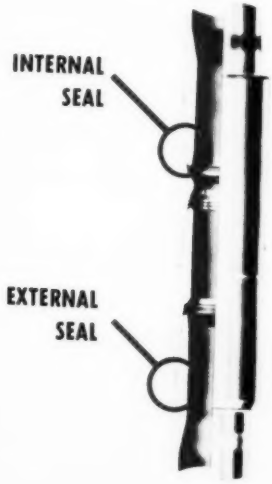

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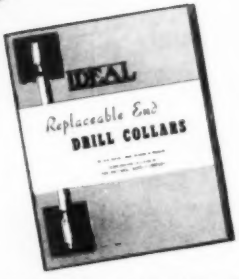

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PRIMARY PRESSURE MAINTENANCE

. . . with water injection . . . in New Hope field, Franklin County, Texas

by Albert S. Trube* and Sam M. Dewitt†

NEW HOPE field, Franklin County, Texas, one of the earliest primary pressure-maintenance programs in a multiple-zone field, has three producing reservoirs into which water is being injected. Inasmuch as the water breakthrough has occurred on only a few wells in one reservoir, it is premature to predict actual results and flood-pattern efficiencies with such a limited amount of actual data.

The field, about 12 miles northeast of Winsboro, Franklin County, is an elongated symmetrical anticline containing four known oil reservoirs. The reservoirs are all of the Trinity group of the Commanchean or Lower Cretaceous period and are found in the sequence:

Reservoir name	Type formation	Average depth, ft.	Estimated productive area, acres
Bacon	Oolitic limestone	7,300	4,609
Hill	Sandstone	7,400	1,284
Pittsburg	Sandstone	7,900	3,304
Elledge	Sandstone	8,200	2,890

Each pay is not present in all of the producing wells because the area and position of the reservoirs vary with respect to one another.

*Tide Water Associated Oil Co., Houston. †Seaboard Oil Co. of Delaware, Dallas. Summarization of paper presented at San Antonio meeting of the petroleum branch, A.I.M.E.

The first three reservoirs contain undersaturated oil. The deepest reservoir, the Elledge sand, has a primary gas cap. Although this reservoir covers a considerable area of the field, it has a very thin section along with a low order of permeability. Elledge producers have generally been characterized by an early increase in gas-oil ratio, making it necessary to recomplete these wells in other sections. At present, one well is completed in the Elledge sand and is still on production. Due to the difficulties encountered in producing this oil, and the small quantity actually present, future attempts at producing this reservoir will probably be on a salvage basis during the later life of the program.

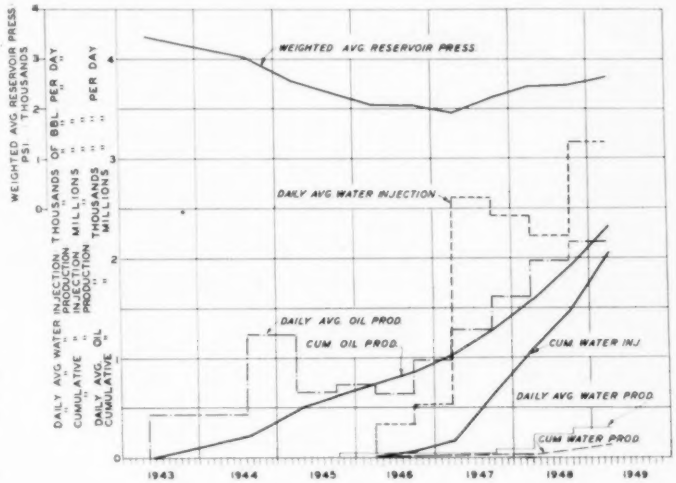

Fig. 1—Pressure and production statistics for the Bacon lime reservoir

TABLE 1—CHARACTERISTICS OF RESERVOIR AND CONTENTS

	Zones			
	Bacon lime	Hill sand	Pittsburg sand	Elledge sand
Discovery date	5-4-43	3-5-44	4-26-43	2-19-44
Well spacing, ft.	440-900	440-900	440-900	440-900
Proration unit, acres per well	40	40	40	40
Interstitial water, per cent*	25.41	30.58	28.73	35.42
Porosity, per cent*	18.9	16.6	13.4	10.8
Permeability, md.*	379	390	61.1	17.3
Original reservoir pressure, Po., psig.	3,425	3,425	3,523	3,741
Saturation pressure, Ps, psig.	907	1,110	1,682	‡3,741
Formation volume factor at Ps.	1.233	1.287	1.456	‡1.952
Reservoir temperature, Tr., °F.	203	208	216	217
Reservoir oil viscosity at Ps and Tr, cent.	0.71	0.73	0.38	
Stock-tank oil gravity, °A.P.I.	43	45	49	52
Solution gas-oil ratio, cu. ft./bbl.	256	286	577	1,475
Avg. compressibility of saturated oil between Po and Ps at Tr, barrels per million barrels per psi. change in pressure	12.00	13.26	15.30	
Est. avg. net pay thickness, ft.	10.98	13.55	17.30	3.42
Est. avg. initial productivity index, bbl. day/psi. drop	1.2	2.4	0.67	
Est. volume of original stock tank oil in place, millions of bbl.	44.89	12.84	20.92	2.74
Est. stock-tank oil recovery between Po and Ps if no water drive present, bbl./psi. drop†	538	170	458	

*Weighted average from core-analysis data. ‡Elledge reservoir contains a primary gas cap. Original conditions estimated from available data. †Barrels of stock tank oil per psi. drop in pressure.

Fifty-nine producing wells have been drilled in the field to date. Not included in this figure are two noncommercial Bacon producers, and one dry hole, each of which was converted into a water-injection well. Also not included is one well which was drilled as an injection well. Three of the 59 producing wells have been converted into water-injection wells, making a total of 56 producing wells and 7 dual water-injection wells at the present time. Most of the 56 producers have been dually completed at one time or another and at the present time there are still 13 dually completed producing oil wells, while 6 of

the 7 injection wells are also used as dual water-injection wells.

Production History

Bacon lime.—A rapid rate of pressure decline even with low average producing rates becomes evident at once. The reservoir, prior to water injection, produced about 550 bbl. of stock-tank oil per psi. drop. This rate of recovery is remarkably close to the value of 538 bbl./psi./day referred to in Table 1. The fact that these, and subsequent pressure surveys, showed little change in the rate of recovery was considered a definite sign of little or no natural water influx. The production pressure relationship, after injection began, increased from 570 to 3,076 bbl./psi./day drop for that interval.

As the pressure declined, more and more Bacon producers ceased flowing. The Bacon, being the most shallow reservoir, had been used for annulus production in the dual-completion program. To attempt to produce at high withdrawal rates would have resulted in reservoir pressures declining below saturation pressure. The producing rates, therefore, declined to an average of 639 bbl. per day for the Bacon prior to the time definite signs of improvement were shown. With the favorable response to water injection, and the subsequent return of reservoir pressures to higher values, more and more Bacon wells began to flow. At the present time, all water-free Bacon producers are flowing and average reservoir withdrawal rates are at an all-time high of 2,166 bbl. per day.

Hill sand.—This reservoir has the most favorable distribution of permeability of all the zones. The expected rate of recovery from laboratory data was 170 bbl./psi./drop. The closest actual approach to this value was 248 bbl./psi./day.

Past pressure behavior indicated that the natural water influx could sustain a total outlet of about 1,000 bbl. of stock-tank oil per day with no water production. Water injection, therefore, was considered necessary in order to achieve a higher producing rate. Water injection was started and pressures are now fairly stable at an average withdrawal rate of about 1,500 bbl. per day. The graph indicates fairly stable conditions at rates of about 1,000 bbl. per day.

In order to combat the problem of water production from Hill Wells, plans are now under way for the injection of water at rates sufficient to return the reservoir pressure at least to its original value. The attainment of this goal would permit the flowing of Hill production to a much higher water cut with a resultant saving in lifting costs.

Pittsburg sand.—The permeability of the Pittsburg sand averages 61.1 md. which is the least permeability of the three reservoirs under consideration. In addition to this, the Pittsburg has the least favorable permeability distribution of the three reservoirs. The first production pressure relationship is consistent with low initial water influx, it was the lowest value observed from field data. The slow rate of increase indicated that the natural water drive was most ineffective.

The high rate of pressure decline and the high order of saturation pressure made it imperative that the first water-injection equipment obtainable be placed in operation for the Pittsburg reservoir. Although response has been poor, a reversal in downward pressure trend was finally effected just short of saturation pressure by the combined influence of decreased average oil producing rates and increasing average water-injection rates. It should be noted that pressures have been increased since October 1, 1949, resulting in a steady increase in the cumulative pressure production relationship.

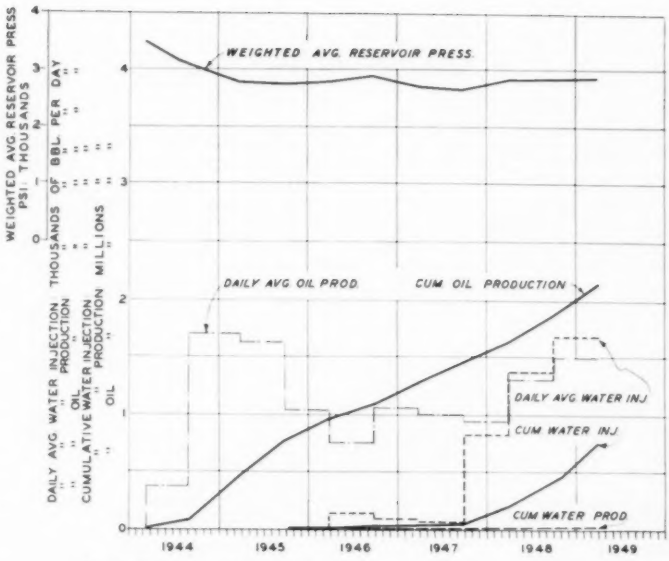

Fig. 2—Pressure and production statistics for the Hill sand reservoir

Oil Recovery

Reservoir-performance history shows that the Bacon and Pittsburg reservoirs would have been controlled

(Continued on page 84)

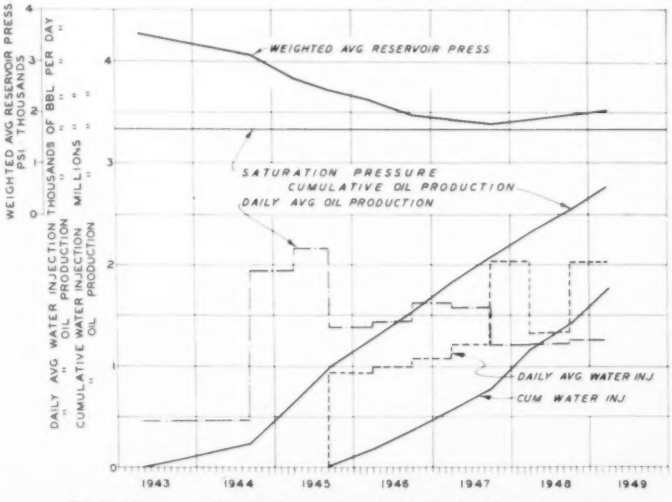

Fig. 3—Pressure and production statistics for the Pittsburgh sand reservoir

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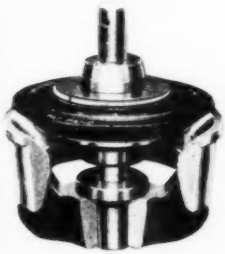

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Various Uses of

Oil-Base Mud

by G. V. Kersten

The author is a district engineer for Western Gulf Oil Co., and has had many years of experience in California oil fields. He was graduated from University of California in 1930 as petroleum engineer. He returned for postgraduate work in 1931, later worked as a gas engineer at Kettleman Hills, and again did postgraduate work in the fall of 1934. He was a gas engineer for Tide Water Associated Oil Co. from 1935 to 1936 and was petroleum engineer and assistant division engineer for Tide Water from 1936 to 1943. He entered the employ of Western Gulf in 1943. This paper is from the technical program of the production engineering conference of Gulf Oil Corp., Pittsburgh.

Reasons for Use

WHY do we use oil-base mud when it is so much simpler to go ahead and drill into the zone with the mud in the hole? The basic reason is to obtain oil wells having best possible performance. The choice as to whether or not oil base is used depends on what function of the following we are trying to combat:

1. **Water block**—actual blocking of pore space due to low permeability and capillary forces.
2. **Hydration**—assimilation of water with subsequent swelling by anhydrous clays within the pore spaces decreasing permeability.
3. **Mud block**—actual entry of mud into the pore space around the well bore, lowering permeability by depositing, drying, and remaining.
4. **Base exchange** — interaction between mud filtrate and component minerals of the sand clays or reservoir rock.
5. **Hole sloughing** — assimilation of water by clay or shale streaks which either swell and creep into the hole or dissolve and enlarge the hole.

Oil-Base Usage at Paloma

A number of wells were drilled at Paloma field, California, before it was found that oil base could help in completing. The early wells were in the permeable condensate area and came in good, but when drilling moved to the less permeable condensate area and into the black-oil belt, it became apparent that completion methods could be improved. Information was received in 1944[1,2] which indicated that completion methods other than with water-base muds would tend to improve the well.

Two wells were completed using oil-base fluid in 1945. Additional information was received during 1946[3] which gave proof through test on cores that Stevens zone sands containing hydratable clays were seriously affected by water, the clay material swelling and decreasing the permeability enormously as is shown in Fig. 1. An additional group of six wells was then completed with oil base using blank liner-type completion, gun perforated at intervals for control. An assessment of cost at this time showed oil base to average $13.50 per barrel to mix and maintain in usable shape (including weight materials). Additional rig time due to handling and the necessary casing program changes ran the cost up.

A group of five wells was then drilled with 1,000-grain per gallon salt-base starch mud. Of this group only one performed satisfactorily, the balance necessitating considerable extra work to cause flow, such as perforating, washing, etc. One well was swabbed as deep as possible and even gas-lifted for 3 days before flow started.

The use of any mud other than oil base was discontinued during 1947 and since then there have been 47 wells drilled and 2 wells redrilled using oil-base fluids.

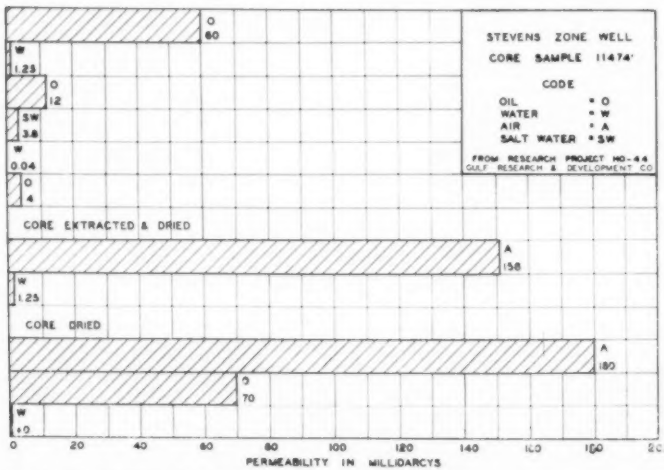


Fig. 1—Bar diagrams illustrating the swelling effect that water may have on cores containing hydratable clays

Fruitvale Practice

Completions and redrills were made with water base at Fruitvale field, California, for many years. During the war most of the wells were redrilled with low-fluid-loss water-base muds, opening all of the oil sands of the zone to production by selective perforating. Considerable well work was necessary to hold production and well performance was erratic.

A recapitulation of field status as to reserves showed rather large additional reserves to be recovered. However, due to excessive well work to maintain the production, bad casing, etc., the economics of recovering this production received considerable attention. The Gulf Research & Development Laboratory[4] was again asked to study cores and fluids from the field, the results of which indicated that the sand binder material leached out upon contact with water allowing the oil sand to be rearranged in the well-bore area, causing unnecessary well work and blocking oil flow.

Fig. 2 clearly shows the effect of oil base on hole size. This hole was changed to oil base with the hole being cased with only 600 ft. of surface pipe at a depth of 3,300 ft. Drilling continued to a depth of 4,100 ft. with oil base in open hole with no trouble excepting some plugging of the shaker screen by mud cake for the first few hours after changeover.

Beginning in the fall of 1947, four wells were redrilled with oil base, then a time lapse was allowed for

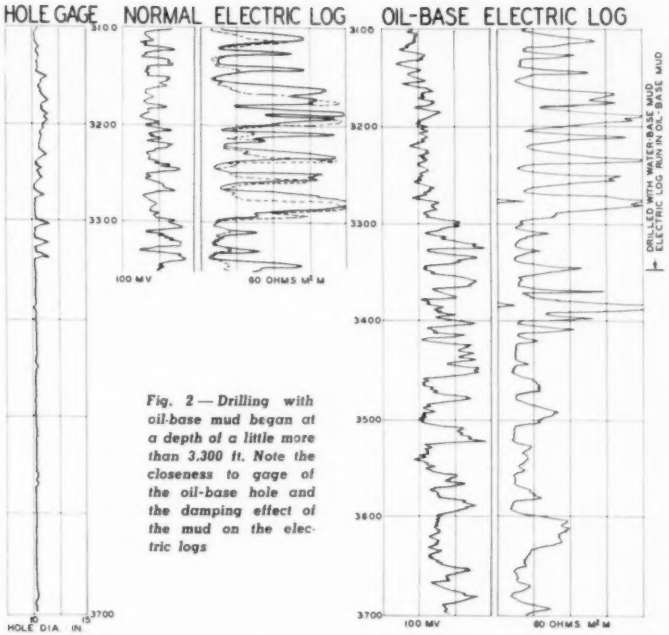


Fig. 2 — Drilling with oil-base mud began at a depth of a little more than 3,300 ft. Note the closeness to gage of the oil-base hole and the damping effect of the mud on the electric logs

study of performance. Since September 1948, 12 additional wells have been redrilled with oil-base fluids and although it is still too early to ascertain as a fact, the performance of these later wells appears to be as good to date as the earlier wells.

Oil base has also been used for remedial work. It is an ideal fluid to kill a flowing black oil or condensate well or an injection well due to the fact that it does not harm the zone and does not readily gasify. It seldom takes over 18 hours to completely kill an injection well which can then be handled safely. Numerous wells have been killed without any apparent harmful effect on their ability to receive injection gas or to produce.

There have been occasional questions about a policy of leaving oil base on top of packers in high-pressure injection wells for which the original casing design was weak. However, the experience of a packer dumping water-base mud on the zone due to packer failure while injecting makes the cost of the oil base nominal. Previous to packer failure one well would take gas at rates up to 15,000 M.c.f. per day and after failure and repair, the well would only take 4,000 to 6,000 M.c.f. per day. The difference between having oil base and water base above a packer for zone protection is very apparent. For approximately $3,000, a $225,000 investment receives protection.

Results of Use

After 3 years' usage at Paloma, it can be said that better wells are being obtained both initially and as to performance and handling. Data have been developed earlier[1] which showed that the wells initially are almost twice as good as those completed with water base. In fact, there is one well which would probably have been a "dud" had it been completed with water-base mud. The average permeability for 500 ft. of zone fully cored and analyzed is 7.66 md., the well having 1,524 md.-ft. of productive sand. It came in for 144 bbl. per day of clean black oil and is still flowing 70 bbl. per day with no evidence of decline. Although, the drawdown is large, the bottom-hole-pressure decline is low and it is evidenced that while the well will never be large, it will be long lived.

Further upstructure in the condensate area, another well was completed with water-base mud at an earlier date and even though the permeability averaged 37.6 md., and it had 2,787 md.-ft. available for production, it failed to flow on its own power and gas lifted only 20 bbl. per day of condensate on test. In another area of the structure a well failed to flow after completing with 5,000-grain per gallon salt-base starch mud and gas lifted 35 bbl. per day. The well was redrilled using oil base and was recompleted from the same zone, flowing 455 bbl. per day through a 28/64-in. bean with 400-psi. tubing pressure. The effects on this type of sand show up not only on initial production but also over time periods.

The use of oil base at Paloma was initiated to combat swelling of interstitial clays. The use of oil base at Fruitvale is to prevent water solutionizing of the binder clays and to maintain hole gage, thus preventing zone sand movement which has given so much trouble in the past.

Pulling work is astoundingly low, being mostly for pump repairs. No washing has been done and the few bail jobs have seldom shown more than 10 to 40 ft. of sand on bottom. Production has usually leveled off within 20 bbl. of initial and has been consistant. It is believed that these results are due to true-gage hole drilled, to fitting as big a liner as is possible, and to the fact that water has not leached the sand binder material, allowing sand movement.

Advantages and Disadvantages

The advantages of using oil base from a result standpoint have been cited above. There are other advantages which from experience, may be of importance:

1. Hole size stays close to bit size.
2. Formation of an excellent thin cake which does not build thickness. This is important in running near-hole-size casing. In one field, 5½-in. flush joint is run in 6⅛-in. hole or 7-in. in 7⅝-in. hole and in most cases the liners are free after reaching bottom. This is exceptional since the hole deviation varies 4°-8° and 300-1,400 ft. of lapped liners are run.
3. Elimination of long cleanup periods after completion. A large number of water-base wells need several months before reaching maximum productivity, whereas, the oil-base completions are clean and at a maximum initially.
4. Has ability to withstand cement contamination without treatment (except for one type of oil base).
5. Minimizes bailing and swabbing. High-pressure wells usually start flowing while changing from oil base to oil before completion.

The disadvantages of using oil base are of importance in assessing its value for use:

1. Its use is more costly than fresh water muds.
2. It is disagreeable and dirty to handle. Crews are inclined to grumble until they become accustomed to using it. A sum of $0.75 per day per man extra is usually paid the help in California while using oil base. This came about from testing one of the original oil-base muds, composed in part of a lamp black which contaminated the body and clothes in such a fashion as to be nearly permanent.
3. Electric logs are not as satisfactory as fresh-water logs. Interpretation is difficult.
4. Weighting material will slowly settle out when stored, although recent developments in treatment tend to minimize this property, particularly while in use.
5. Excessive contamination with water will damage oil base and therefore extra precautions are taken such as a wiper for the working string.

drains for the standback, guards on water-cooled draw works, and for the cellar and mud pits. Oil base has been used containing up to 20 per cent water. However, considerable time and expense is involved in cleaning it up and usually one winds up with additional volume due to adding new materials.

6. It is a fire hazard. Precautions are taken by imposing rigid fire rules against any type of flame around the rigs.

Types of Oil Base

There are three types of oil-base fluid available in California: types "A," "B," and "C." These types appear to be used in approximately equal proportions.

Type "A" is composed of blown asphalt, water, calcium oxide, diesel or gas-oil, and naphthenic acid. To obtain 1 bbl. of mud, 34.1 gal. of diesel or gas-oil, 0.98 gal. of water, $\frac{1}{4}$ gal. of naphthenic acid, and one sack of type "A" concentrates are mixed. There are three weights of concentrates available forming 60, 72, and 80-lb. per cu. ft. muds. This type of mud mixes much better if the mixing is done with 140° to 160° F. heat available. However, both at Paloma and at Fruitvale, the mixtures were made and used without heat.

The viscosity is controlled through use of a chemical "X" or diesel oil and the naphthenic acid, the acid increasing viscosity and the oil or chemical "X" lowering viscosity. It has been recently found that the condition of the mud while in use in a well may be determined by the filter loss. If there is a filter loss in $1\frac{1}{2}$ hours the mud is short on asphalt or concentrate; if there is no loss, the mud is in good shape.

The advantages of this type of oil base are as follows: high water tolerance with ease of treatment for water. Unslacked lime is used to remove water with no effect except slight weight increase. The mud has a high cement tolerance, merely showing a slight weight increase. It has a high flash point, decreasing fire hazards. The disadvantages are: there is some tendency to drop weighting material with the higher-weight muds if the condition of the mud is not closely watched. It is difficult to mix thoroughly without the addition of heat.

The constituents of type "B" oil base are diesel oil, asphalt, salt, water, caustic soda, sodium silicate, tall oil and crude oil, diesel oil or gas-oil. The sodium silicate when mixed with tall oil and other components of the drilling fluid forms a soap. The viscosity of the soap mixture controls the viscosity of the mixture. The advantages of this type of mud may be cited as follows: it has a cheaper initial cost which amounts to approximately $8.50 per barrel of 80-lb. per cu. ft. mud delivered at the well. It suspends weighting material very well. It mixes easily at low temperatures. The disadvantages are as follows: the economic fresh water tolerance is 15 per cent, however, its tolerance for salt water may go as high as 40 per cent[5]. It is difficult to treat for water contamination. It has a low tolerance for cement, flocculating and causing additional treating expense.

Type "C" oil base is a newcomer in the oil-base field, being marketed within the last year in California. The mud was developed and tested by Union Oil Co.[6], and has recently been licensed for marketing to a mud-service company. It is composed of an oil-soluble metallic ester and other unrevealed ingredients which form their concentrate. The concentrate is mixed in the ratio of 1 bbl. of concentrate to 9 bbl. of crude oil of low gravity range, 14°-24° Be' or light fuel oil, 18° Be'. The thinning agent is stove oil, absorption oil, or diesel fuel. The thickening agent is heavy fuel oil or heavy crude oil.

If it is desired to increase viscosity and at the same time lower the fluid loss, additional concentrates are added. The advantages of this mud are as follows: high water tolerance up to 27 per cent without serious effects and ease of water treatment by using unslacked lime or crude oil dilution. High cement tolerance—merely increasing the weight of the mud. Ease of mixing. The mud may be easily compounded at the well without heat. The mud appears to maintain good properties even after accidental dilution with crude oil. The disadvantages are as follows: when stored, the weight material will slowly settle; however, it does not compact and may be mixed back with relative ease. The electric-log characteristics are not as good as water-base fluid logs.

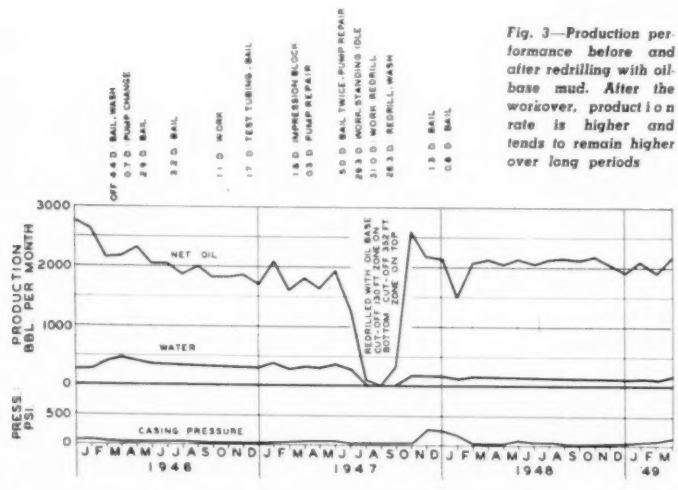

OFF 44 D BAIL-WASH
07 D PUMP CHANGE
29 D BAIL
32 D BAIL
11 D WORK
17 D TEST TUBING - BAIL
18 D IMPRESSION BLOCK
03 D PUMP REPAIR
50 D BAIL TWICE-PUMP REPAIR
29 3 D WORK-STANDING IDLE
31 0 D WORK REDRILL
28 3 D REDRILL-WASH
13 D BAIL
04 D BAIL
PRODUCTION BBL. PER MONTH
3000
2000
1000
0
NET OIL
WATER
REDRILLED WITH OIL BASE CUT-OFF 130 FT ZONE ON BOTTOM CUT-OFF 33 FT ZONE ON TOP
PRESS PSI
500
0
CASING PRESSURE
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M
1946
1947
1948
49

Fig. 3—Production performance before and after redrilling with oil-base mud. After the workover, production rate is higher and tends to remain higher over long periods

Handling of Oil Base

The method of handling oil-base mixtures may increase the cost of its use. If a program of usage is set forth in any one field, it may be found that a central mud-treating plant will facilitate operations and cheapen the cost of its use. Deep zone operations in general demand this type of mud handling. Shallow zone operations may be handled on a "from well to well" basis.

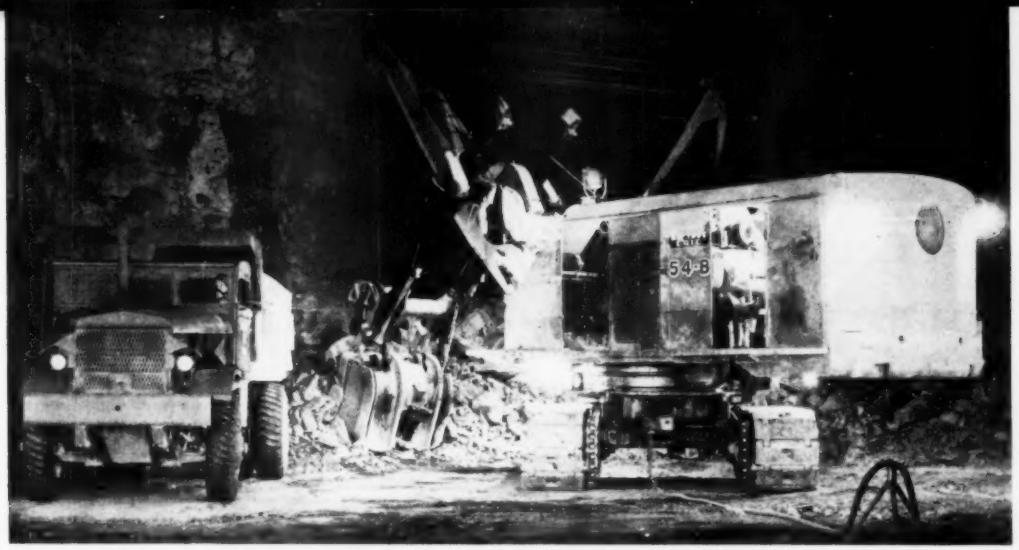
Western Gulf Oil Co. Paloma operations are carried out with the use of a mud plant; the Fruitvale operations are on a well-to-well basis.

Cost of Oil Base

The cost of 80-lb. per cu. ft. type "A" mud premixed and delivered to the well site is $9.57 per barrel. The cost of 59-lb. per cu. ft. is $9.25 per barrel on the same basis. Since the Paloma mud plant mixes its own oil base, this does not represent the cost of use at Paloma. The present determined charges for 80-lb. mud at Paloma is $9.16 per barrel for class 'A" mud and $8.24 per barrel for class "C" mud. These figures include all mud plant charges such as supplies, fuel, labor, repairs, etc. It does not include depreciation of the plant. The average monthly operating cost of the plant for the first 3 months of 1949 was $882 per month. During this period 5,761 bbl. of new and used oil base were handled and treated through the plant.

On a per barrel basis of mud charged to the well, Paloma oil-base mud cost is $3.41 per barrel average to use. The average cost per well to use the fluid is $2,619 and represents 1.28 per cent of the average total well cost. This is a relatively small expenditure to insure good well performance. One other company operating at Paloma expends 2.23 per cent of well investment on use of oil-base fluid. This operation does not have

(Continued on page 87)



One of the underground operations for producing oil shale. Here the shale, previously broken from the mine wall by drilling and blasting, is being loaded for transportation via truck to crusher and retort

Retorting Colorado's Mahogany Ledge Shales—A Report on Developments

by Robert Harwick
District Editor

CONTAINING neither shale nor oil, Colorado oil shale is a magnesian marlstone, composed of calcium and magnesium carbonates and clay minerals. It contains solid organic matter from which shale oil can be recovered. The shale is found in the Piceance Creek basin of northwestern part of the state, 200 miles west of Denver.

The Piceance Creek basin plateau is underlain by oil shale up to 1,000 ft. in thickness. The center of the 1,000-ft. bed is known as Mahogany ledge. This ledge is 50-100 ft. thick and assays more than 25 gal. of shale oil per ton. Mahogany ledge underlies 1,000 sq. miles of the Piceance Creek basin and is capable of yielding 100 billion barrels of shale oil. The burden over Mahogany ledge varies from 300 to 1,000 ft. thick. This is sufficiently large an overburden to make mining by underground methods the economical choice over strip mining.

Shale is broken from the mine wall by drilling and blasting. Drilling in shale mines is still not a completely solved problem. The compressive strength of oil shale is 15,000 psi., the shear strength 6,000 psi., and the tensile strength 2,000 psi. This would indicate that rotary methods of drilling should be used.

The first attempts at rotary drilling were unsuccessful. Percussion drilling was then tried and found adequate. At present the most powerful percussion drills manufactured are used for drilling shale at the Bureau of Mines oil-shale mine at Rifle. Drilling speeds range from 1 to 2 ft. of penetration per minute. Drill carriages mounting four drills operated by two men are used.

The bureau is continuing rotary-drilling research and recently has obtained promising results. By using especially strong cemented tungsten carbide bits and exerting considerable pressure, rotary drilling rates up to 6 ft. per minute have been achieved.

After a series of holes are drilled into the oil-shale face in a suitable pattern, the holes are charged with explosive. The explosive found most effective is a 45 per cent strength semiammonium gelatine dynamite, the cost of which amounts to one-quarter of the total direct cost of mining the shale.

Because oil shale is capable of supporting its own weight over 100-ft. spans, Mahogany ledge can be mined safely from one large room. Present practice now uses pillars 60 ft. square spaced 60 ft. apart supporting the roof of the mining area.

After being mined, the shale goes to the crusher. Heavy equipment such as the jaw and gyratory types will crush oil shale without trouble. Toothed rolls, hammermills, and other high-speed crushers may be adequate. The experience of the Bureau of Mines shows that oil shale is tough and springy and often is ejected from the crusher jaws before it is broken.

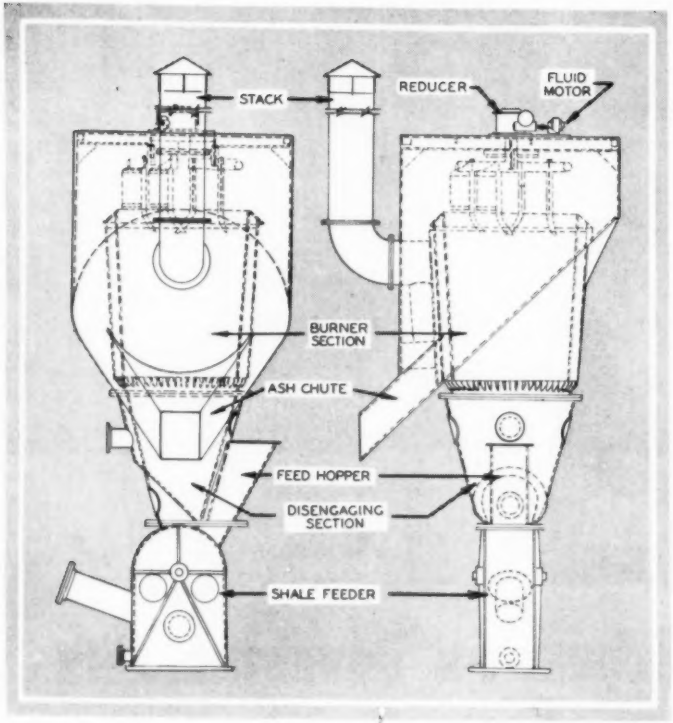
The demonstration mining done and crushing information obtained indicates that oil shale can be mined, crushed, and delivered to the retorts at a cost of less than 60 cents per ton.

Retorting of Oil Shale

Development of the Union Oil Co. retort, which processes oil shale mined at Rifle, was carried out in conjunction with economic studies on a variety of shale-retorting methods. These studies emphasized the importance of economically handling the large quantities of heat which must be added and recovered from the shale in the course of retorting.

Only the most economical means for effecting heat transfer to the raw, incoming shale and highly efficient heat recovery from the discharging clinker can bring low shale-retorting costs. In the Union Oil retort, highly efficient heat exchange is obtained.

The retort developed by Union Oil is located at the company's Wilming-



Schematic arrangement of the retort for processing oil shale. Crushed shale is fed into the bottom of the retort and after passing into the burner section is discharged from the kiln via the ash chute. Separation of oil and gas from the shale bed occurs in the conical section of the retort below the burner section

ton refinery near Los Angeles. It consists of a cylindrical kiln with a hydraulically operated underfeed mechanism. Movement of the granular shale is upward through the unit with overflow at the top. Clinkers are removed by a hydraulicaliy actuated scraping mechanism and fall into an ash-disposal chute. The sections of the kiln expand gradually upward, minimizing restriction to movement.

The shale kiln (see accompanying drawing) employs an externally finned retorting section with cowling to direct air flow over the fins and control shell temperature. A secondary stack draws the air through the cowling section. Cooling of the shell by this arrangement is designed to effect a maximum metal temperature of 750° F. at the burning zone.

A conical, slotted section below the retorting section effects the separation of the oil and gas from the shale bed. A collector surrounds this section. Gas is drawn from the collector by a blower operating in conjunction with an ultrasonic mist agglomeration unit. This assures complete separation of the oil mist from the retort gases.

The feeding mechanism at the base of the unit is so constructed that any fines falling through the grate return to the feeding piston and are reintroduced into the unit. This prevents the gas and oil-collector housing from plugging through accumulation of fines. The feeding mechanism is filled with oil to a level just below the slot edges, providing a liquid seal. The seal prevents the blower from pulling air through the feed hopper.

Kiln Operation

Operation of the kiln is entirely automatic. Flow of air is regulated by an automatic controller actuated by an orifice located at the outlet of the blower. A temperature controller operated by thermocouples located at the shell of the retort controls temperature of the burning section at a point approximately 3 ft. below the top of the kiln. Control is obtained by regulating the feed mechanism.

The various processes occurring in the kiln retorting section take place in three zones. In the top zone, heat exchange between incoming air and hot clinker leaving the unit is effected. In the lower portion of this top zone combustion of the carbon residue on the clinker takes place, producing flue gas with a temperature near 2,000° F. This flue gas progresses into the second zone, termed the retorting zone, where the oil is educted from the shale. The mixture of shale-oil vapors and flue gas passes downward to the third zone. This is the condensation zone. Here the incoming green shale is heated and the products of eduction are cooled and the oil condensed. The temperature of the exit oil and gas approaches within 20° the temperature of the shale being charged.

Shale from the Colorado deposits generally exhibit fusion of the ash in the retorting operation. The extent of such fusion is largely influenced by retorting rate and the position of the combustion zone in the kiln. Thirty-gallon-per-ton shale will fuse to a certain degree. Shale on the order of 50-55 gal. per ton is characterized by a semiplastic condition in the burning zone. The clinker discharge consists of semifused agglomerates which have been rolled into lumps by the overhead ash discharging mechanism. Seventy-gallon-per-ton shale shows an even more plastic condition in the burning zone and the ash discharge is definitely clinkered.

Unlike the conventional retort or gasifying kiln, fusion of ash is not considered a problem in the Union retort. In this retort the plastic ash zone is exposed to the free action of the scraping prongs of the ash-removal device.

In the retorting of shales, an appreciable portion of the oil produced leaves the unit as a mist in the gases drawn from the base of the unit. The character and amount of the mist varies with the grade of shale being retorted. A 50-50-gal. shale produces an effluent gas mixture containing a relatively small quantity of mist of large particle diameter. It is easily collected. Thirty and seventy gallon shales exhibit greater mist formation and the particles are smaller. This mist requires special handling. However, it is completely recovered in the combination ultrasonic agglomeration and "Roto-clone" collection equipment.

To put the kiln in operation it is filled with shale. The crankcase and disengaging section are filled with oil. A layer of kindling wood is placed on top of the shale and ignited. The blower of the kiln is then started and the fire is drawn down through the shale bed, igniting the mass of shale. When the top shale layer has burned to a clinker, the feeding mechanism and the ash-removal equipment are started. Oil production is normally obtained from the unit within 10 or 15 minutes after ignition. Inspections of crude shale oil are given in the accompanying table.

Refining of Shale Oil

As the organic material in oil shale does not exist as oil but is recovered as oil only after decomposition and

(Continued on page 88)

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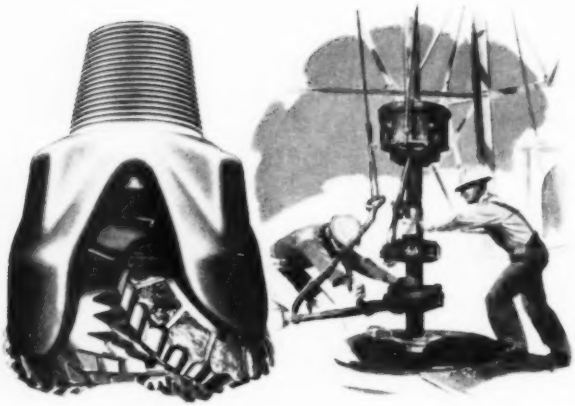

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HELICOPTERS NOW ROUTINE IN OIL EXPLORATION

by Charles J. Deegan
Associate Editor

THE use of helicopters in oil-exploration work has passed the stunt stage, and the occasional use under exceptional circumstances. In the marsh land of southern Louisiana, helicopters are being used by gravity-meter and seismograph crews in an almost routine manner. Two service companies, with a total of eight helicopters, offer a contract service just like any other commercial service organization.

Petroleum Bell-Helicopter Services, Inc., privately owned, is one. Bell Aircraft Supply Corp., a service subsidiary of Bell Aircraft Corp., makers of helicopters, is the other. Both organizations have base headquarters at Lafayette, La.

A substantial amount of pioneering work had to be done to get helicopter service to its present status; and additional ideas are being worked on right now. At the recent regional exploration societies meeting in Biloxi, Miss., some of the results were demonstrated in a dramatic fashion, as shown in the accompanying pictures.

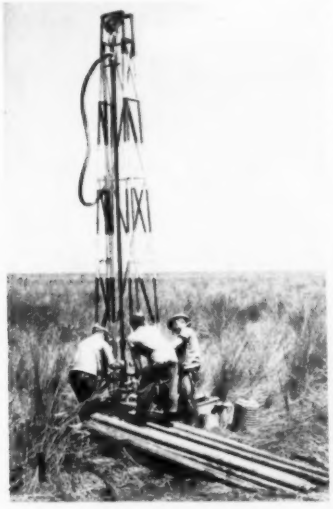
In addition to the demonstration, E. E. Gustafson of Bell Aircraft Supply Corp. supplied some interesting data on the results of 18 months' practical experience. In seismic operations, two to three helicopters are used. Experience, it is claimed, has shown that production is always doubled, and sometimes tripled as compared to normal ground methods. Helicopters assist in laying and towing cable, planting of geophones, moving recording equipment and observers into position, transporting shooting crews and dynamite to shot holes, and (see photographs) transporting the shot-hole drilling rig and crew from one spot to another.

The use of helicopters in gravity-meter work has progressed considerably since the earliest trials. *(See The Oil and Gas Journal, June 7, 1947, page 61).* Nowadays the helicopter has holes in the floor, through which a tripod can be lowered into the marsh. The gravity meter fits on top of the tripod and the observer takes his reading without leaving the ship.

Gravity Work Performance

One company recently completed a 7-month job involving the use of helicopters. The total number of stations was 9,342, or 1,334 per month. Of these, 7,374 were new stations, 1,557 base checks, and 411 reruns. More than half of all the work was "fill in," cleaning up and filling in areas that had been previously surveyed by other methods.

The target for flying was 22 working days per month; the actual average was 21.4 working days per month.



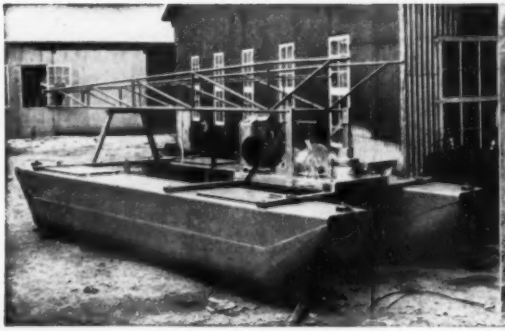
1—Seismograph crew's shot-hole drilling unit on location in Louisiana marsh on a job for Gulf Oil Corp. This unit was specially designed for helicopter work by Careys Machine Co., although originally helicopters carried conventional drilling units of whatever type the crew happened to be using. The entire unit shown, including crew, was carried to this location by helicopters of Bell Aircraft Supply Corp.

2—In demonstration for geologists and geophysicists at regional convention in Biloxi, Miss., a shot hole drilling unit similar to that shown in Fig. 1, was erected, then torn down into units for transport by helicopter.

In this picture the pilot, R. S. Stansberry, with Petroleum Bell-Helicopter Services, Inc., has picked up the first of three steel boxes into which torn-down unit has been loaded. James Baskin, American Exploration Co., is traveling with pilot to new location. Francis Temple, American Exploration Co., stays with remainder of equipment and will assist pilot in loading on subsequent trips

3—Stansberry, pilot, and Baskin are landing at new location with first package of drilling unit, at site marked by pipe. Baskin will help unlash the steel box, then stay at new site and start getting ready to erect the unit as subsequent loads arrive

ALL ALUMINUM
MARSH DRILL—SHOOTING TRUCK



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DETACHABLE PUMP UNIT with clutch 15000 g.p.h. — powered by Onan 10 hp. air-cooled engine.

SPECIFICATIONS:
Heaviest Unit—250 lbs.
Dismantle and Reassemble—20 min.
Base Dimensions—30" x 46½"
Rotary: Oil bathed; 3½" opening
Drilling Depth—200 ft.

MINOR CHANGES MADE TO SUIT BUYER

STANDARD EQUIPMENT:
Water Tank—300 gal. cap.
Wooden lined powder box
Cap box

SPECIFICATIONS:
Total Weight—535 lbs.
Powder Box—500 lbs. cap.
Water Tank—300 gal. capacity; vacuum loaded, braced, and all welded by Heliarc method.

CONSTRUCTION: 3/16" aluminum 61ST

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6

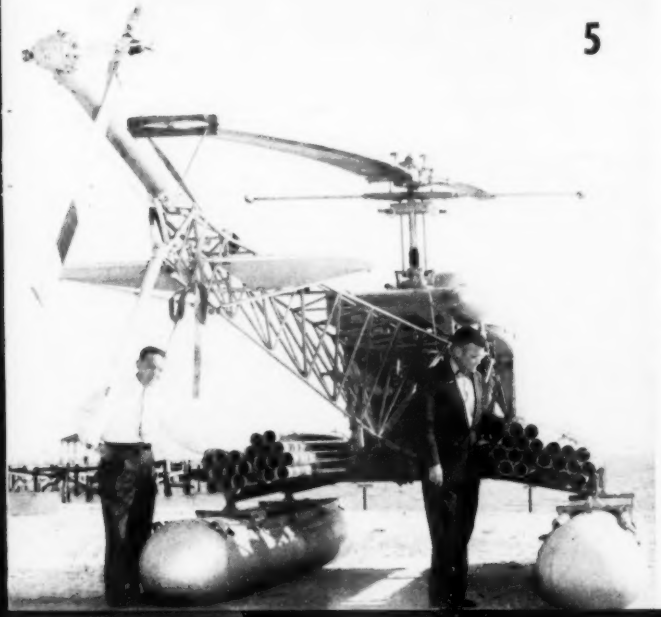
indicating the dependability that has been reached. The safety record established by one company is rather impressive. There were only five accidents, nobody injured in any of them, in over 8,000 hours of flying time. Considering that a pilot may make from 100 to 300 landings and takeoffs in a day, the record is still more impressive. In large part this is due to the special pilot training used. Regardless of a helicopter pilot's past experience, he is given a special "oil pilot" training course. Some of the special problems are landings and takeoffs in saw grass, hidden stumps in grass, cross-wind landings on barges, etc. When a man has finished this course he is considered a really experienced marsh pilot.

The surveying for position location is still something of a bottleneck. At present, in some cases the station can be located from the use of aerial photographs, and then transferred to other maps; triangulation by surveyors on top of wooden towers is still used in some cases. This involves moving towers and surveyors and reduces production time. Experiments are now going on in the development of lightweight shoran radar to be carried in the helicopter.

In the relatively flat marsh land, elevation problems are not so serious, therefore the airborne shoran may solve most of the problems of surveying there. In more rugged topography, the problem of securing elevation data quickly still remains.

It is a rather curious quirk that the first commercial use of the helicopter should be in the coastal swamps. In their prewar-day dreams, most exploration scientists had visions of helicopters floating gently over mountainous terrain, while the scientist leisurely examined the country below. Unfortunately the aerodynamic facts of life regarding service ceilings, useful load-carrying capacity at various altitudes, etc., brought about a completely opposite result. However, experimental-model helicopters capable of carrying 12 passengers or 3,000 lb. useful load are now being test flown at the factory. At this moment, however, the only other oil-exploration use of helicopters is in the Canadian bush country, where gravity surveys are being made.

Out of all these operations, many lessons are being learned. So, the day will probably come when the geologist's dream will come true, and he will be able to hover over rugged mountain terrain and examine the geology from a true "bird's eye view." Present experience indicates though that he had better discard that word "leisurely" from his dreams. It costs considerable money to keep a helicopter in the air for an hour, and some one is going to have to produce a substantial amount of work to show for that hour's expense.



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4—The last load consists of the derrick. Having lashed it in place, Temple has climbed in with pilot, and they are off to join Baskin at the new location

5—At present the helicopter-borne seismic crews are using conventional steel pipe in shot holes. Since weight is always important, experiments with aluminum pipe are being watched. Aluminum Pipe, Inc., of Houston, has fabricated pipe from extrusions furnished by Reynolds Metal Co., and field trials of the pipe are now being carried on by regular seismic crews. If successful, this may speed up helicopter work. At Biloxi are shown, left to right, Charles J. Deegan, associate editor, The Oil and Gas Journal, and F. V. Long, vice president, Aluminum Pipe, Inc., examining 400 ft. of 3½-in. aluminum pipe, total weight 320 lb. loaded on the helicopter for transport. In four bundles of 80 lb. each, the pipe was handled quickly and easily in loading and unloading

6—R. S. Stansberry, pilot, demonstrates helicopter control by practically hovering in the air in posing for the photographer while carrying 400 ft. of aluminum pipe

Corrosion Mitigation *within* Dehydrating Tanks

by Ernest O. Kartinen*

CORROSION of dehydrating tanks continues to be a problem in the production of crude oil. The deterioration by corrosion of these tanks falls into three general classifications: (1) Atmospheric corrosion of exterior areas; (2) corrosion of the underside of deck and the rafters and top area of the upper row of staves in that part of the tank known as the vapor space, and (3) corrosion of the bottom, shell areas, and the steam coils which are normally immersed in water and exposed to the corrosive action of the water.

Atmospheric corrosion and corrosion in the vapor space have been omitted in this discussion. The most troublesome type of corrosion, and the one with which this report deals, is that which occurs in the water-exposed areas of dehydrating tanks, and, to a lesser degree, in some stock tanks.

Operational Difficulties

The operating temperature of these waters varies from 80° to 160° F. and the salt counts run from a few thousand to as high as 25,000 p.p.m. Corrosion in tanks occurs in three forms: (1) pits, (2) ringworm type of attack along the vertical and horizontal bolt seams, and (3) as a general attack, spread over a wide area.

In dehydrating tanks, the steam coils show signs of corrosion first, and then the shell and bottom areas. This action is not uniform throughout this company's operations, but in the majority of cases the coils are the more seriously corroded areas. This may be partly due to the fact that we have tried by periodic application to keep a protective coating on the interior areas of the tanks.

Several types of hot and cold coatings have been tried with many methods of cleaning the steel . . . ranging from use of cleaning solvents to hot and cold Oakite washes, as well as sandblasting. Although experience has shown that a longer life expectancy of a coating is possible after a very thorough steel cleaning job, it has still been necessary to recoat these tanks at least every 2 or 3 years.

Until a few years ago, vertical spiral steam-coil bundles were installed when the tanks were originally erected. When these coils needed replacement, in some cases within 18 months, it was necessary to remove a couple of shell staves to accomplish this task. This required a downtime period of several days and was often very inconvenient to the production operations of the leases.

To eliminate any unnessary down time when changing coils, the vertical spiral coils were discarded in favor of horizontal flat coils which could be taken in and out of the tanks by way of the cleanout openings, and put together with unions. This made a fairly easily replaceable and repairable coil. But it was still very much of a nuisance when repairs were necessary.

Efforts to increase the useful life of the dehydrating tanks led to the adoption of galvanized tanks at an increased initial cost. The zinc coating was depended upon for protection and no other protective coatings were applied.

A dehydrating tank installation made in April 1946 consisted of a 1,500-bbl., three-ring galvanized tank with two sets of flat steam coils 12 and 24 in. up from the bottom. About 17 months after installation, salt showed up in the boiler feed water. When the dehydrating tank was opened and cleaned, the steam coils were found to be badly pitted, several holes having penetrated through the wall of the pipe. New coils were installed.

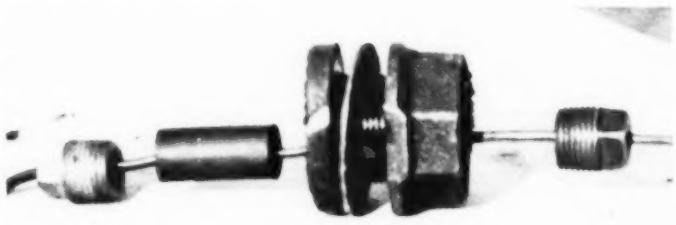


Fig. 2—Special rubber bushing designed for fluid-tight lead-wire entrance into the tank

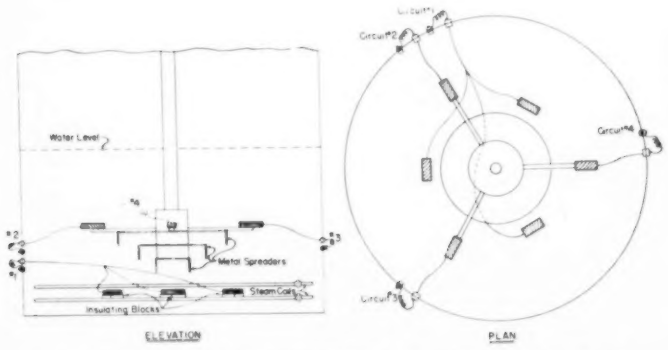


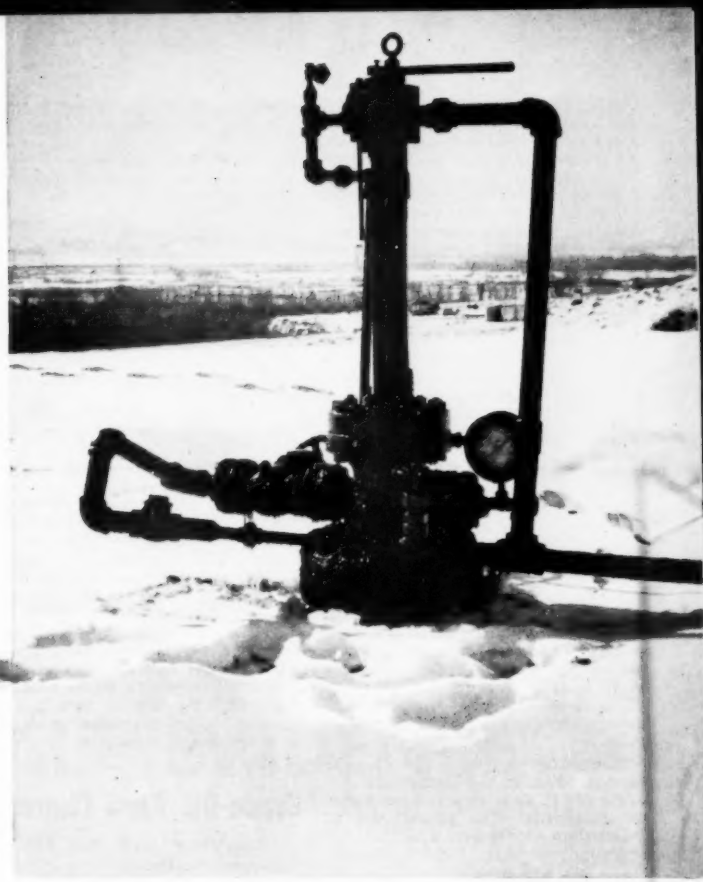
Fig. 1—Location of the magnesium anodes in the galvanic protection system

The shell of the tank was also found to be very seriously corroded below the oil level. The most serious corrosion from a structural standpoint was the continuous corrosion along the vertical bolt seams and the chimes.

Numerous isolated pits were found in all the shell staves and the bottom. Several of them had practically penetrated the steel. The bottom of the tank was found to have only a few small pits. It was also observed at this time that the zinc coating had practically all disappeared and had been replaced by a soft, light-colored coating which brushed off and exposed black iron.

*Signal Oil & Gas Co., Los Angeles. Portion of paper presented at A.I.M.E. meeting, Los Angeles.

Can you be *sure* this winter?



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After this experience, it became apparent that some solution to the corrosion problem was necessary, and an investigation into the possibilities of protecting the water-immersed areas of dehydrating tanks by cathodic protection was undertaken.

In the application of cathodic protection, the metal to be protected is electrically connected to a negative terminal at a source of current such as a rectifier, generator, or battery. This type of an installation is known as a forced drainage system. Galvanic anode drainage is a form of forced drainage which uses an anode of an active metal such as zinc or magnesium. The drainage current depends on the galvanic potential between the metal to be protected and the anode.

Forced or Galvanic Anode Drainage?

After some consideration, it was felt that at least partial protection of the dehydrating tank and the steam coils with a properly installed cathodic protection system was possible. There then arose the question of whether a forced drainage or a galvanic anode drainage system would be installed. Experimenting with a 16-lb. magnesium anode in oil-field brine showed that it would develop approximately 2 amp. at .6 volts.

Magnesium anodes were decided upon in this initial installation because of (1) their ease and simplicity of installation. The initial cost of magnesium anodes over a rectifier installation was much less. (2) Magnesium has the greatest solution potential of all commercially available anodic metals. (3) It has a high content of stored energy—the electrochemical equivalent of 1 lb. of magnesium being theoretically equivalent to 1,000 amp.-hours. (4) It is now readily available because wartime production facilities are being used to fill peacetime markets.

Lead wires were brought through the shell of the tank by means of a special bushing and then grounded to the shell on the outside of the tank. Fig. 1 shows position of anodes in the tank. Fig. 2 shows the tank flange with rubber bushing and plugs to provide a watertight seal around the lead wire.

The galvanic system developed a current density of approximately 8.04 ma. per sq. ft., and resistances were introduced into the four circuits to cut down the total amperage output to give a current density of approximately 5 ma. per sq. ft. Readings on all four circuits were taken at frequent intervals and the current output closely tabulated. Also, at this time, while waiting for new coils, this tank was painted inside with three coats of plastic coating.

After 4 months' operation, large sections of coating were observed floating out into the waste water pit, and it was evident that the protective coating had disintegrated. The tank was opened and the coating was 100 per cent ineffective after 122 days. But, significantly, it was observed that the pits, which 4 months previously were shining and bright, now had a dull black luster. There were no traces of pitting on the new steam coils, and all the wrench and punch marks on the coils were sharp and dull in color. The entire exposed steel shell and steam coils had a dull black luster. With these observations, the anodes were removed and the loose coating washed off with a fire hose and new anodes installed. The tank was then closed and put into service.

The second test period on this tank ran for 288 days. As was previously observed, the tank steel had a dull color and the coils which had now been in the tank for 13 months showed no signs whatsoever of corrosion. The deep pits which had practically penetrated the steel after 17 months, have in this last 13 months shown no further corrosive action.

Detailed Inspection Made

This dehydrating tank was again opened 7 months later for a routine washout and cleanup. At this time a detailed inspection of the tank was made and the anodes were approximately 75 per cent dissipated. Pits were examined closely and found to have the same dull black color. The entire steel area of the coils and shell was coated with a thin, hard, black coating. This coating was very hard to remove by hand wire brushing. After a very careful inspection, no further trace of corrosion could be detected anywhere in the tank. This tank has been under cathodic protection for approximately 631 days without any further trace of corrosion.

It has been concluded from this experiment that (1) apparently 5 ma. per sq. ft. provides sufficient current density for complete protection; (2) .6 volts potential between steel and magnesium provides sufficient voltage to provide the necessary current; (3) the anode spacing as was used provided ample coverage; (4) bolted seams provided sufficient contact between tank sheets and staves; (5) although the tank was not isolated from rest of the system by insulating flanges, no harmful effects have been detected anywhere in the system.

It is felt from experience to date that this type of protection is economically feasible and offers better and more protection of the water immersed areas of dehydrating tanks while also protecting the steam coils than any protective coating which we have applied to date.

Crude-Oil Flow Characteristics

(Continued from page 64)

Under our present method of calculating, no provision is made for the additional pressure loss through valves, fitting at junctions, and station manifolds.

The basis of our calculations is the actual distance of line between stations with the correction for elevation head being taken as the difference in elevation between the station floors. Though most of our stations operate with a tank floating on the line, there are times when they pump their entire stream into a tank at the next station. This would have the effect of increasing the discharge pressure at the pumping station due to the additional pressure drop through the tank line. No correction is made for these operating conditions although the tank lines are ½ mile in length at some stations.

An additional factor that will be corrected for by using a higher line for f is the decrease in effective internal diameter between the running of scrapers. As the lines grow older, the value of f experienced may increase due to internal corrosion in some lines, although past performance has shown this factor to be a negligible one in trunk lines where velocity is sufficient to prevent the settling out of water, the primary cause of internal corrosion.

Considering the effect on capacity, the maximum difference encountered is 2.7 per cent between using the straight line for f and the Stanton and Pannell curve for f.

While it is realized that the data presented here are not all inclusive, it is felt that it is a realistic addition to the field of pipe line hydraulics. The accumulation of data such as included here in time-consuming as well as costly, but it is hoped that further study can be made of flow conditions in commercial pipe-line systems, for information gathered in this manner will be of definite aid to the pipe-line engineer.

The writer wishes to acknowledge the help of members of the engineering department of Stanolind Pipe Line Co. and particularly the aid of L. E. Tomlinson and W. E. Roads who assisted in some of the test work and offered helpful suggestions in compiling the data here presented.

Primary Pressure Maintenance

(Continued from page 70)

by solution drive, and that the Hill sand had a partial water drive. Estimates of recovery by natural means were made using the method outlined by Babson[1] for the Bacon and Pittsburg. For the Hill sand, however, additional estimates based on availability of reservoir water, flood-pot

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experiments, and permeability distribution were made.

As a result of this work it was found that normal recovery from the Bacon lime would have been 170 bbl. per acre-foot, from the Hill sand 260 bbl. per acre-foot, and from the Pittsburg sand 155 bbl. per acre-foot. The increase in recovery, due to water injection, was originally estimated to be at least 45 per cent, based on permeability distribution.

In the Bacon lime a breakthrough pattern became evident early in 1948. The fact that three adjacent producing wells began making water within 3 months of one another indicates that the invaded region was expanding uniformly.

One of the characteristics noticed from a study of the breakthrough was that the principal direction of the water front was toward the center of the reservoir rather than around the periphery. The reason for this behavior may lie in the fact that the average capacity (md.-ft.) approaches zero near the reservoir limits and that most of the oil withdrawal is from the central area which has a relative high capacity. The behavior of the water-producing wells, therefore, is encouraging and shows that these wells will probably not be lost as producers until the main flood from another injection well has caught up with them.

In the Hill sand there is evidence of water encroachment along the south flank of the reservoir. Nothing is known, however, about the present position of the water front on the north flank of the reservoir because the Hill producers in that area were completed high in the sand.

In the Pittsburg sand all of the producing wells are making pipe-line oil. The evidence of water encroachment, therefore, has not been established except on the basis of reservoir-pressure response.

Indications to date are that the three reservoirs have been responding to water injection with no evidence of channeling. Because of this favorable reaction it is now believed that the ultimate recovery from the three reservoirs will be increased at least 70 per cent over that recoverable by natural means.

Water-Injection Program

Since the initial calculations had indicated that the Pittsburg sand would be the most difficult reservoir to handle, it was decided that injection should be started in that reservoir first. Accordingly, a dry hole located on the south flank of the reservoir, was converted into an injection well. During the following experimental period, it developed that, instead of taking 1,000 bbl. of water per day at 1,300 psi. injection pressure as calculated from permeability data on wells inside field, well required 3,500 to 4,000 psi. injection pressure to take only 400 bbl. per day.

The experience with this well indicated that the permeability of the Pittsburg reservoir had decreased materially below the oil-water contact. This also accounted for the poor water drive as evidenced by pressure behavior. The results of the experimental period disclosed that the only means of injecting water into the Pittsburg sand in this well was by the continued injection of unaerated water at the low rates and under the high pressures indicated at first.

A second attempt was made by converting another dry hole into a Pittsburg sand injection well in the hope that a better injection well could be obtained. The second Pittsburg injection well proved to be no better than the first inasmuch as it too would take about 500 bbl. of unaerated water per day at 4,000 psi. well-head injection pressure. Subsequent history shows that these two wells averaged about 940 bbl. per day while reservoir withdrawal rate was held to about 1,400 stock tank barrels per day. Although the 940 bbl. per day rate was considered sufficient to cause some reflection in pressure decline, it was noted that no definite reaction was apparent which could be credited to water injection alone.

All of the injection wells, except one, were converted from dry holes, noncommercial producers, or producing wells located within the reservoir limits. This well was drilled intentionally as a Bacon-Pittsburg injection well.

Water for the injection system has been supplied from three fresh-water wells in the shallow Wilcox sands and one salt-water well which is completed in the Woodbine section. This water is delivered under pressure as needed to surface storage tanks by means of deep well centrifugal pumps. Particular caution has been exercised in keeping air away from this water once it reaches the surface. The system is completely closed and at no point is the line pressure allowed to go below 5 psig. Vessels are equipped so as to maintain a gas seal.

No difficulties are encountered in the injection of air-free water other than the unusually high injection pressures. All of the producing formations are exceptionally clean with no appreciable bentonitic materials present. As a result there has been no noticeable plugging action because of water injection.

Experience has shown that it has not been practical to inject salt water at very high pressures. Much difficulty was encountered in the attempt to inject salt water into the Pittsburg sand under pressures in the 4,000-psi. range. Most downtime was caused by plunger scoring and packing failures resulting from the attempt to use Woodbine salt water.

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Various Uses of Oil-Base Mud

(Continued from page 74)

the benefit of a central mud plant to keep costs down.

The mixing of the type "C" oil base used at Fruitvale is done at the well and the moves of oil base are made from well to well. The average cost to mix 59-lb. per cu. ft. new oil-base mud at a Fruitvale well is $7.10 per barrel for materials only. The present determined charges for class "A" oil base is $8.25 per barrel and $4.13 per barrel for class "B." These figures include handling and mixing charges on a well-to-well basis. They do not include weighting material.

The average well cost is $1,846 to use the oil base. Considerable oil base is lost to the formations at Fruitvale and as a result the charge per well is higher than it would normally be for 4,500-ft. wells. The average cost per barrel to use the oil base on a basis of materials charged to well is $3.54. The figure of $1,846 per well for oil base represents approximately 6 per cent of the redrill cost to obtain sand and well protection.

The figures quoted above for Paloma and Fruitvale fields do not include extra weighting material costs or transportation charges for moving the oil-base mud.

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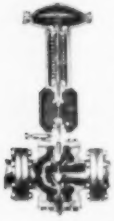

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(Continued from page 76)

distillation, it follows that raw shale oil itself is a cracked distillate. And there are other physical and chemical differences between shale oil and natural petroleum. The differences are enough to require refining methods different from those used for crude oil.

The main problems in refining shale oil are: (1) high carbon-hydrogen ratio, (2) high pour point, (3) high degree of unsaturation, (4) high oxygen and nitrogen content. To overcome these conditions Union has worked out in its pilot plant a system of refining based on a recycle coking operation followed by hydrogenation.

The coking operation as planned, thermally cracks high-boiling fractions into fractions that boil in a lower range. Improvement of the carbon-hydrogen ratio by carbon removal in the cracking process also results and some depression in pour point will also be realized.

The catalytic hydrogen process developed by Union operates at moderate pressure. The process will greatly reduce the high oxygen and nitrogen content. Sulfur content will also be improved.

The coking operation will supply enough gas to meet the requirements for hydrogen production. Coke and excess gas will supply most of the energy needed for the refining step. Hydrogen will be produced through the reaction of steam and the hydrocarbon gas.

There is at least one byproduct that should have ready market value in the refining plan. This is ammonium sulfate. With some variations in procedure it is possible to produce ammonia.

The coking, hydrogenation, and fractionation equipment needed will be very similar to equipment already in wide use. The development work is in the process itself rather than in the development of new apparatus.

INSPECTIONS OF CRUDE SHALE OIL

Gravity, °A.P.I. at 60° F.	20.5
Gravity, specific at 60° F.	0.9309
Distillation, °F.:	
Initial	410
10 per cent	505
30 per cent	630
50 per cent	687
70 per cent	705
Per cent over	62.0
Sulfur, wt. per cent	0.82
Nitrogen, wt. per cent	1.93
Oxygen, wt. per cent	1.12
Carbon, wt. per cent	84.7
Hydrogen, wt. per cent	11.43
Viscosity (S.S.U. at 100° F.)	315
Viscosity (S.S.U. at 210° F.)	49.4
Pour point, °F.	90
Tar acids, per cent	5.3
Tar bases, per cent	7.1
Conradson carbon, per cent	4.19
Characterization factor	11.58
B.s. and w., per cent	0.3

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Fuel-Oil Additives

What do you think of fuel-oil additives? Do they really do what the manufacturers claim?—S. T. F.

Little appears in the technical literature concerning the use of fuel-oil additives or even what they are, but advertising literature and claims are voluminous.

The sludge that settles out of fuel oils, particularly A.S.T.M. No. 6 and No. 5, is troublesome and it seems reasonable that emulsification agents would help keep existent sludge-like materials in suspension, and in some instances they might assist in dissolving or removing sludge accumulations. Claims that the formation of sludge within the oil can be stopped or delayed are more doubtful.

Occasionally the sludge is delivered with the oil but most frequently the sludge found in fuel-oil tanks is produced by exposure to the air, condensation of moisture, excessive heat, and the natural accumulation of dirt, rust, pipe scale, lint, grit, sand, etc. Of these materials, gums, resins, asphaltenes, coke, and polymerization products are the natural product of long storage and exposure to air, particularly if the temperature is high (120° F. and up). Many of these sludge materials cannot be entirely avoided because they are inherently related to the oil itself. Mud, sand, twigs, wood splinters, water, etc., seem to indicate carelessness in the handling of the oil although the condensation of water is justifiable if the tank must be repeatedly heated and cooled. Tank or pipe scale, gasket materials, and shreds of pump hose are natural accumulations, as are lint or rag shreds derived from tank-cleaning operations. Except for the sludge items that are inherently part and parcel of the oil, most of the difficulty with sludge can be eliminated by careful handling and the periodic cleaning of lines and tanks.

Clean System Thoroughly

If the tank is kept free of mechanical dirt or sludge, the accumulation of resins, gums, asphaltenes, etc., can be avoided to a large extent by the use of suitable solvent and emulsification-type additives. Our recommendation would be to clean the system thoroughly before employing an additive because it might suspend the sludge so thoroughly that it would clog the strainers and the burner orifices. Likewise, if the fuel system has sludge in it, the "splash" or "drop" method of loading would be bad because it might stir up the sludge. A submerged loading line is more satisfactory if the system is dirty.

Little is known of the agents being sold. Among the materials mentioned are petroleum sulfonates dissolved in distillate or kerosine, naphthalene and caustic soda (powdered), coal-tar distillates or their derivatives, solvent materials, and certain higher alcohols. Amounts of 1 pt. to 1 qt. of liquid additives per 1,000 gal. are recommended and the cost ranges from $1.50 to $5 per gallon of additive.

There are so many different types of sludges and of fuel that a particular additive might be useful with one oil but detrimental with another. For this reason the additive should always be tested on the oil being used. Vendor's claims include:

1. Less sparkling.
2. Less soot and carbon deposits.
3. Keeps nozzles, strainers, etc., clean.
4. Eliminates costly cleaning of tanks.
5. Reduces fuel consumption.
6. Lowers viscosity.
7. Dissolves sludge masses.
8. Assists in cold-weather handling.
9. Clean combustion chamber.
10. Easier starting—no flashback.
11. Alleviates tank corrosion.

"—Volatile Hydrocarbons"

To whom should one write to obtain a copy of Brown, Katz, Oberfell, and Aldens, "Natural Gas and Volatile Hydrocarbons," and what does it cost?—R. M.

This book (paper bound) is sponsored or sold by the Natural Gasoline Association of America, Kennedy Building, Tulsa, price $4.00 (1948). The cost is not high when the 8½ by 11 page size and the detailed charts are considered. It is Section 1 of several parts that will be published covering material on phase equilibria, thermal properties, viscosity, surface tension, separation processes, and the applications of these properties and methods to gasoline and cycling-plant operations. The petroleum industry has particularly been looking forward to the section (now in process of publication) that will pertain to phase equilibria.

The present Section 1, entitled "Natural Gasoline and the Volatile Hydrocarbons," treats of the following:

Chapter 1—Behavior of Petroleum Hydrocarbons
- Nomenclature for Phase Relations
  - Pure Substances
  - Binary Mixtures
  - Complex Mixtures
  - Retrograde Condensation
  - Multiple Phase Systems
  - Estimation of Vapor Liquid Equilibrium
- Physical Properties of Hydrocarbons
  - Definitions and Units
- Energy or Thermal Properties of Hydrocarbons
- Families of Hydrocarbons

Chapter II—Fluid Densities
- Compressibility Factor
- The Theorem of Corresponding States
- Construction of Compressibility Charts
- Use of Compressibility Charts
  - Fluid Mixtures
- Natural Gases
  - Estimation of Density in Two-Phase Region
  - Pseudo Critical Temperatures and Pressures
- Other Methods
- Densities of Saturated Vapors and Liquids
- Densities of Liquids and Fluids
  - Effects of Temperature and Pressure
  - Liquid Mixtures

Chapter III—Vapor Pressure
- Complex Mixtures
- Reid Vapor Pressure

Chapter IV—Critical Properties
- Pure Hydrocarbons
- Binary Mixtures
- Complex Mixtures
  - Estimating the Critical Temperature
  - Estimating the Critical Pressure
  - Mixtures of Gases and Liquids
  - Estimating the Critical Density

An enormous number of physical data are available in the 92 pages of the book. This information is presented in elaborate tables and in clear, large-scale figures. Some information on the use of the data is included. In general, however, a schooling in chemical engineering and particularly chemical-engineering thermodynamics is necessary if the extensive data in the book are to be properly understood by the reader. In the past, the engineer has had to resort to many books, pamphlets, article reprints, photostats, enlargements, etc., for the information contained in Section 1 of the book. As other sections appear, the book or series will undoubtedly become the basic source for all phases of technical information needed by the natural-gasoline industry.

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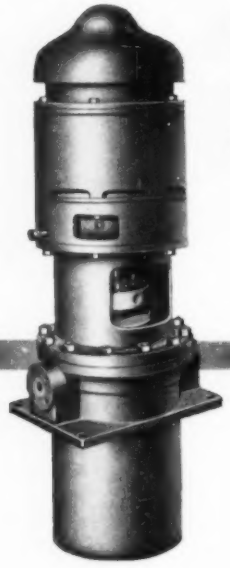

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- Diffusor-type construction eliminates radial thrust
- The first-stage impeller is located on the bottom—Extra NPSH is therefore obtained
- High pressure breakdown above the last stage impeller balances pump thrust

An Ingersoll-Rand engineer will be glad to tell you more about Class VP Pumps. Ask for your copy of Form 7145-A.

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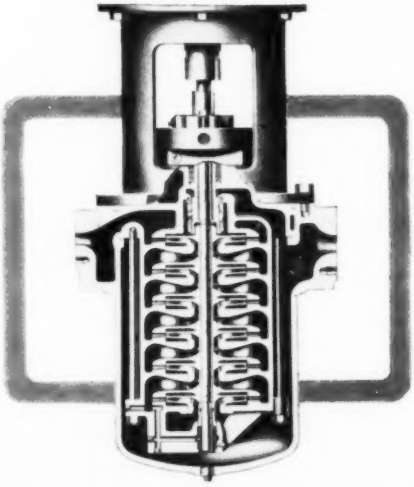

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Cost-imating

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Over-All Plant Costs—Miscellaneous

(Approximate)

Schedule of Topics

The following issues complete the Cost-imating Series. However, the Nelson Index of Refinery Construction Costs will appear each month (first issue) in The Oil and Gas Journal, as well as quarterly publications (January, April, July, October) of the Cost Indexes of items of construction equipment.

No. 55, Nov. 3—Labor
No. 56, Nov. 10—Steam Jet Ejectors
No. 57, Nov. 17—Effect of Size on Cost
No. 58, Nov. 24—Over-All Plant Costs—Cracking
No. 59, Dec. 1—Over-All Plant Costs—Distillation
No. 60, Dec. 8—Over-all Plant Costs—Miscellaneous
No. 61, Dec. 15—Refinery-Construction Index
No. 62, Dec. 22—Current Itemized Indexes
No. 63, Dec. 29—Alphabetical Index of the Cost-imating Series

COST INDEXES (1946 = 100)

	Chemical construction*	Nelson Refinery†
1926	79	72.0
1928	76	71.0
1929	73	72.0
1930	65	70.6
1931	62	64.9
1932	61	56.6
1933	56	56.7
1934	59	62.7
1935	62	62.7
1936	65	67.3
1937	70	74.3
1938	56	76.8
1939	56	76.6
1940	57	77.6
1941	73	80.0
1942	80	83.7
1943	81	86.6
1944	83	88.1
1945	84	89.9
1946	100	100.0
1947	119	117.0
1948	130	132.8
1949 est.	130	138.0

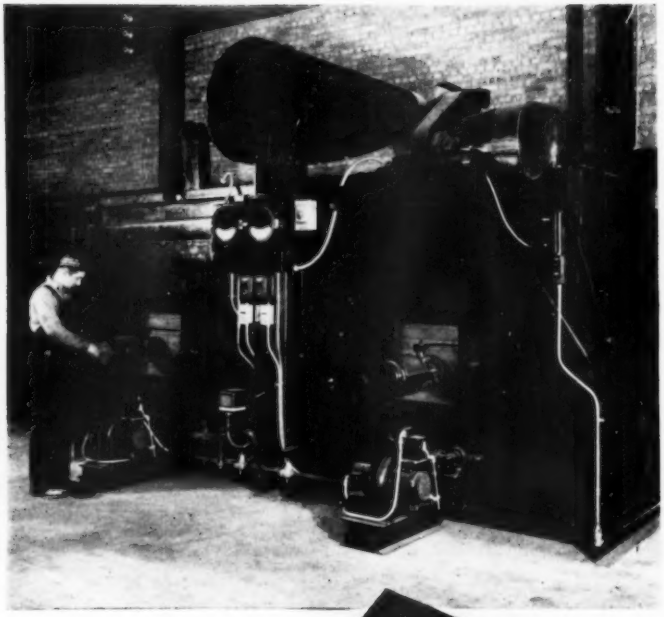
*Marshall Stevens, Chem. Eng. Quarterly. †Cost-imating No. 61 appearing December 15, 1949.

AN INDICATION OF THE COSTS OF VARIOUS REFINING PLANTS (1946)

Type of plant—	Capacity	Cost of material, labor, and engineering
Acid treating		$19-39 per daily bbl.
Alcohol*		$83 per yearly ton
Alcohol†	1,175 B.P.B.	$38 per yearly ton
Alcohol, allyl		$1,800 per yearly ton
Alkylation	1,700-3,400 B.P.D.	$465-740 per daily bbl.
Asphalt loading and storage	6,000 B.P.D.	$9 per daily bbl.
Butadiene, complete		$530 per yearly ton
Catalytic cracking	(See Cost-imating No. 58)	
Carbon black	40-50 million lb. per year	4.5-7 cents per lb.
Centrifuging, no rerun‡	600-1,000 B.P.D.	$850-2,100 per daily bbl.
Cracking	(See Cost-imating No. 58)	
Coking	(See Cost-imating No. 58)	
Copper sweetening, solid		$2.60 per daily bbl.
Copper sweetening, liquid	1,000-10,000 B.P.D.	$5-19 per daily bbl.
Desalting, crude oil	1,500 B.P.D.	$7 70 per daily bbl.
Desulfurization, catalytic	(See Cost-imating No. 58)	
Dewaxing, solvent	(See Cost-imating No. 59)	
Dewaxing, filter press	400-1,200 B.P.D.	$210-280 per daily bbl.
Ethylene	15,000-70,000 tons per year	$83-127 per yearly ton
Gasoline plants	(See Cost-imating No. 59)	
Gray vapor-phase treating		$19-32 per daily bbl
Hypersorption	(See Cost-imating No. 59)	
Hydrogen manufacture	200 M.c.f. per day	$755 per daily M.c.f.
Hydrogen-sulfide removal§	(See Cost-imating No. 59)	
Inhibitor injection		$0.25-2.50 per daily bbl.
Loading rock	11,900 B.P.D.	$2.40 per daily bbl.
Lube-oil filtering	250 B.P.D.	$43.50 per daily bbl.
Lube-oil solvent treating	(See Cost-imating No. 59)	
Lube-oil solvent dewaxing	(See Cost-imating No. 59)	
Lube-oil solution rerun	1,000-5,000 B.P.D.	$54-97 per daily bbl.
Lube-oil pressed distillate rerun	1,000-5,000 B.P.D.	$55-102 per daily bbl.
Pressure distillate rerun	1,000-10,000 B.P.D.	$20-65 per daily bbl.
Polymerization, catalytic	(See Cost-imating No. 58)	
Reforming, thermal	1,000 B.P.D.	$60 per daily bbl.
Solvent extraction	(See Cost-imating No. 59)	
Solvent dewaxing	(See Cost-imating No. 59)	
Topping alone	(See Cost-imating No. 59)	
Topping and cracking units	(See Cost-imating No. 58)	
Tetraethyl lead blending	1,000 B.P.D.	$19 per daily bbl.
Vacuum distillation	(See Cost-imating No. 59)	
Vacuum flashing	(See Cost-imating No. 59)	

*Ethyl or isopropyl via sulfuric acid. †Direct hydration. ‡Dewaxing of cylinder stock. §Mainly Girbotol.

No. 60 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



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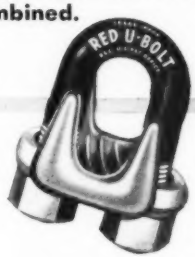

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ENGINEERING *fundamentals*

No. 391

Reservoir-Well Systems

PETROLEUM reservoirs are those rock formations or portions of rock formations within the earth wherein hydrocarbons have been accumulated locally in sufficient quantities to be of commercial value. Three physical properties are inherent to any petroleum reservoir. First it must possess porosity. The rock formation must be of a type with pore space in order to contain a sufficient amount of the reservoir fluids. Second, the reservoir must possess permeability.

Permeability is that characteristic of a reservoir rock which permits the fluids to flow within it. Without permeability the fluids could not flow from the host rock to the well. Third, the reservoir must be a fluid trap of some sort. There must be a characteristic that causes the accumulated fluids to remain within the confines of the reservoir. Above the reservoir this is usually accomplished by a cap rock, an impervious layer of rock formation which prevents the reservoir fluids from moving vertically.

The lateral movement of fluid away from the reservoir accumulation is prevented by means of structure, stratigraphy, or lithology. The former includes those instances in which the cap rock is folded in such a manner that it seals not only the top of the reservoir but also its sides. Stratigraphic sealing includes those instances in which the rock formation containing the hydrocarbons terminates at a given point so that lateral movement of fluids is prevented.

Lithologic sealing includes those instances where lateral motion of reservoir fluids is prevented because the pore spaces of the rock formation have been filled with a cementing material causing a loss of permeability and porosity.

Because a reservoir has permeability, the space occupied by the reservoir fluids is an interconnected network. The fluids within this continuous pore space are therefore a common composite mixture and they will possess some common character. The gas, oil, and water phases within the continuous network will be segregated according to the differences in their densities. A third consequence of the continuity of the fluid containing pore space is that there will be a continuity of hydraulic conditions within the reservoir. An individual reservoir totally interconnected in its pore space and containing common reservoir fluids has come to be known as a **common source of supply.**

The recognition of such characteristics of petroleum reservoirs has led to an understanding that the fluid behavior in one portion of a reservoir cannot be considered separately from the fluid behavior in another part of the reservoir. A reduction of pressure at one point is felt in all portions of the reservoir. The speed of transmission of such effects is, of course, dependent upon the individual characteristics of the reservoir and reservoir fluids.

This concept of treating a reservoir as a unit in examining its behavior is opposite to the concept of considering the individual well as a unit, as was the case in the early days of the industry. However, as with all trends, there developed an overemphasis upon the reservoir concept, to such an extent that the importance of the well was minimized. There has recently been a reversal of this trend to the proper position of balance between the importance of the reservoir and the wells within it. In effect one must consider the reservoir-well system as an entity.

The importance of the well itself cannot be overlooked. It is the means of access to the reservoir, the medium through which all measurements on the reservoir and its fluids are possible, and is the means of operational control on the reservoir. The number of wells in a reservoir, the position of these wells, and the manner in which they are completed and operated have a significant bearing upon the control of the individual reservoir.

Since all reservoirs are different it is impossible to say that the well pattern and behavior in any two reservoirs should or will be the same. Each reservoir-well system must be considered in the light of its own characteristics.

The interdependence between reservoir behavior and well behavior is quite broad. The type fluids which a well will produce and the rate at which they will be produced depends upon reservoir characteristics such as pressure, temperature, permeability properties, and the type of displacement mechanism in action, as well as upon the number of wells which penetrate the reservoir and the manner in which the wells are completed. Conversely, the operation of wells can control the mechanism by which oil is produced from a given reservoir. Whether a reservoir is under control of a water drive, solution gas drive, or gravity drainage may depend upon the manner in which wells are completed and operated.

A complete study of reservoir behavior, therefore, involves a study of individual well behaviors and individual well characteristics, but it is reemphasized that one cannot study these behaviors independent of a study of the reservoir itself as a complete unit.

In considering the reservoir-well system care must be exercised in examining those characteristics of the system which are properties of the reservoir and its fluids alone and not of the placement of wells. For example, the imposition of a given well pattern upon a reservoir can change in no way the permeability of the reservoir rock or the relative permeability. These are properties of the reservoir rock and the reservoir fluids.

An important physical quantity which may fall in this category is the ultimate recovery or residual oil content of a reservoir. If it can be shown that this quantity is a function only of formation characteristics and reservoir fluid properties, then the well pattern and completion methods adopted for a reservoir need not consider it as a factor. If it can be shown that the residual oil content is not solely a property of the reservoir rock and its fluids then the type of well system imposed on the reservoir may or may not be important, depending upon individual circumstances. Present engineering knowledge points to the conclusion that residual oil content is a function solely of the reservoir rock, the reservoir fluids, and the displacement mechanism.

Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, University of Oklahoma

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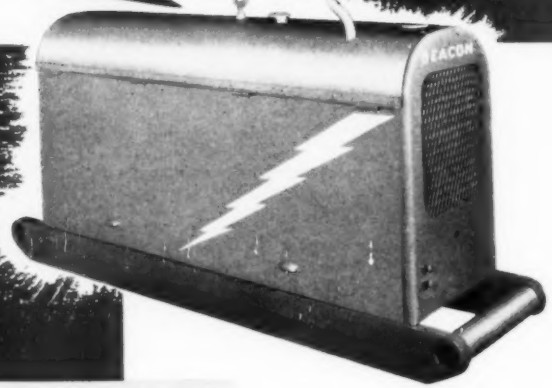

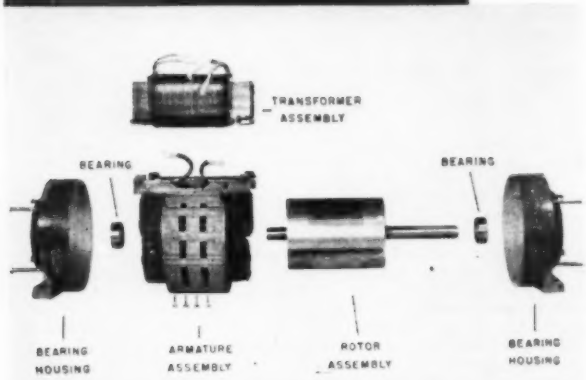

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OIL AND GAS EQUIPMENT Digest

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TRADE LITERATURE

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2 VERNON FLUID SEALED STUFFING BOX is an illustrated brochure listing the principles and construction features of a new type stuffing box. *Vernon Tool Co., Ltd.*

3 PARMACO PRODUCTS is a 20-page catalog listing engineering specifications and prices on a complete line of anchor packers and related production equipment. *Parkersburg Machine Co.*

4 STEEL BUILDINGS. This 36-page, multicolor book gives general specifications, types and sizes, details of construction, details of design, interior-finish details, and standard accessories of a complete line of industrial sectional steel buildings. Of particular interest is a section on petroleum-industry buildings. *Braden Steel Corp.*

5 SPEED OIL RIG MOVING describes the advantages of moving derricks from location to location on Forged-Trak Wheels without disturbing crown block, traveling block, or draw works. *Athey Products Corp.*

6 PARLON PAINTS, a six-page folder, describes the physical characteristics of this base paint, particularly pointing out its resistance to alkalies, moisture, acids, gases, corrosion, oils, and abrasion. *Hercules Powder Co.*

7 CAST CARBON STEEL GATE VALVES provides complete specifications on a line of small-sized, 600-lb. carbon-steel gate valves for high-pressure service. This valve is manufactured in two lines, the bolted bonnet type and the union bonnet type. *Pacific Valves, Inc.*

8 KASKADE FRACTIONATING TRAY. This brochure gives information on the performance of Koch Kaskade trays in distillation, absorption, and liquid-liquid extraction. *Koch Engineering Co.*

9 UNIPUMPS. In addition to typical applications this 12-page, 2-color booklet illustrates all construction features, and lists in tabular form all technical data required. *Weinman Pump Manufacturing Co.*

10 FOSTER CATHEADS is a set of specification sheets and engineering drawings of Air Spinner, Air Master Breakout, Midget Master Breakout, and Midget Spinning catheads. All four catheads are illustrated. *Foster Cathead Co.*

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OIL AND GAS EQUIPMENT Digest — ITEM CHECK IT

11 AIRFLEX CLUTCH. a 32-page multicolor book, describes clutch types, features, power takeoff, horsepower ratings, service ratings; illustrates each type; and presents representative applications. *Fawick Airflex Co., Inc.*

12 HEAVY-DUTY LOW-SPEED GAS ENGINES discusses the characteristics of gas on an economical, convenient fuel and presents a particularly clear graphic description of the features of the engine. *Bruce-Macbeth Engine Co.*

13 CHAINS AND SPROCKET RIMS FOR OIL WELL SERVICE illustrates, both photographically and with dimension drawings; gives capacity and intended application; and all specifications on each design of roller chain and sprocket rim listed. *Jeffrey Manufacturing Co.*

14 HYDRAULIC PACKERS is sectionalized under the following general headings: "Hydraulic Release Principle," "Use of Formation Packer for Gas/Oil Ratio Control," "New Acidizing Technique," and "Hydroseal Packer Rubber." *Sweet Oil Well Equipment.*

15 NULLMATIC M/P CONTROL STATION. In addition to describing a full line of control equipment, this large-size folder offers a full-size, full-color, actual picture of the 25-ft. control panel at Rock Island refinery. *Moore Products Co.*

16 RECORD PIPE TOOLS features hinged pipe vises for pipe from ⅛ to 12-in. diameter; chain pipe wrenches for pipe from ⅛ to 18-in. diameter; and three-wheel pipe cutters available for cutting pipe from ⅛ to 12-in. diameter. *C. & J. Hampton, Ltd.*

17 MAGNESIUM ANODES explains the principle of cathodic protection in combating corrosion, and the characteristics of magnesium as an effective anode. The bulletin also carries a cost analysis on installation of anodes, a section on installation and applications, and a selection guide. *Dowell Incorporated.*

18 MODERN SPARK ARRESTER DESIGN is in effect a text book on the history and development of modern spark arresters. *Burgess Battery Co.*

19 FAHRITE REFINERY TUBE SUPPORTS illustrates only a few of the many types of heat-resistant alloy tube supports for refinery and field processing use. Brochure also includes charts on physical properties at elevated temperatures on the alloys from which these supports are made. *Ohio Steel Foundry Co.*

20 O-C-T is a complete catalog of oil-field production equipment designed by Oil Center Tool Co. which has licensed this British manufacturer to make and sell its products in pound-sterling countries. Blowout preventers and other wellhead equipment are featured. *LeGrand, Sutcliff & Gell, Ltd.*

21 PUMPING VISCOUS MATERIALS is a paper presented at the first Pan American Engineering Congress at Rio de Janiero, Brazil. It is a complete technical treatment of the problems and solutions involved in this field. *Kinney Manufacturing Co.*

22 NEG'ATOR CLAMPS, a new two-color technical bulletin, designed for industrial personnel engaged in engineering, development, maintenance, and production activities, describes a new and unique industrial clamp. It discusses the new type of clamp from three aspects: principles, characteristics, and applications. *Hunter Spring Co.*

23 HARDNESS TEST FOR WATER ANALYSIS describes a simple hardness test for water analysis which is more accurate than the soap method and considerably more rapid. This new hardness test is a convenient titration method employing a color indicator. *W. H. & L. D. Betz.*

24 MODEL HM PAYLOADER, an eight-page, two-color brochure illustrates rugged performance of this four-wheel drive, power-steered shovel with 1½-yard bucket. This dirt handler digs, loads, carries, dumps and bulldozes. *Frank G. Hough Co.*

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THE OIL AND GAS JOURNAL
BOX 1260
TULSA, OKLAHOMA

OIL AND GAS EQUIPMENT Digest

IT'S NEW ✓ CHECK IT

by Dan B. Miller

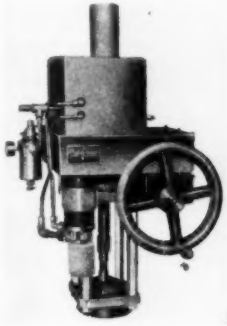
25 BOTTOM-HOLE PUMPING CONTROL is run in combination with a production packer and regular bottom-hole pump. A positive choke is incorporated in the control for the purpose of establishing a constant pressure on the sand and a uniform rate of withdrawal in order to prevent water coning and to stabilize the sand to prevent heaving. Above the choke and below the pump is an oil and gas separator which vents gas out the casing and delivers only dead, degassed oil to the pump. Gas from the casing may be utilized for lease purposes, or vented to atmosphere if desired. The use of the choke ahead of the separator, where the initial pressure is suddenly dropped and expanded, releases solution gas, and after being passed through the separator, the oil is dead and ready for pumping. All gas locks and gas interferences are eliminated. Since the well does not head, the unit may be balanced and kept in balance. *Pumprite, Ltd.*

IT'S NEW ✓ CHECK IT

26 BS&B FUEL VAPORIZER, actually a miniature topping plant, is designed to fuel pipe-line pumping engines and gas-engine equipment on lease pumping jobs where gas is failing. Exhaust heat from the engine, usually wasted, is used to heat the crude oil sufficiently to vaporize the lighter hydrocarbons: propane, benzene, naphtha, and gasoline. These lighter hydrocarbons are passed to the engine as fuel in vapor form. Some gasoline vapors may be condensed from the generated gas and stored for starting the engine later. The fuel vaporizer is a package unit equipped with all necessary controls. It is insulated to prevent heat loss from the exhaust gas heater and the flash separator, both of which operate at high temperatures. It is built in four standard sizes of 20, 40, 110, and 300 hp. *Black, Sivalls & Bryson, Inc.*

IT'S NEW ✓ CHECK IT

27 ROTOMOTOR is a new, revolutionary pneumatic power operator for throttling control service. The operator employs a reversible pneumatic motor and gear-driven screw stem. It combines the features of a self-locking stem, continuously connected handwheel, extreme sensitivity, and small, compact size. Additional features are accurate positioning to within 1 500th part of stem travel; sensitivity to instrument changes as low as .025 p.i., high stability; stem loads up to 10,000 lb.; stem travel up to 20 in.; stem speeds up to 12 in. per minute; adaptability to any type of heavy-duty throttling control application. *Conoflow Corp.*



IT'S NEW ✓ CHECK IT

28 REVERSIBLE STABILFLO CONTROL VALVE. In a few minutes' time and without the use of special tools the new valve can be changed from "air to open" to "air to close," or vice versa. It is not necessary to remove the valve from its installation or to shut down the controlled flow. To reverse the action of the valve motor it is only necessary to remove the housing assembly, rotate it one quarter turn, and replace it. This requires the removal and replacing of four bolts. *Foxboro Co.*

IT'S NEW ✓ CHECK IT

29 DIESEL-DRIVEN PORTABLE AIR COMPRESSOR. For users who prefer full diesel-engine drive for their portable compressors. The en-

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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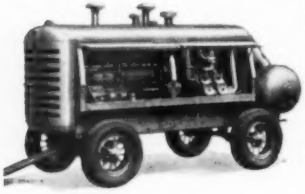
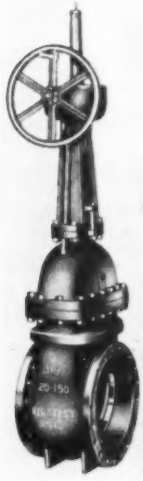
gine is the well-known International Harvester heavy-duty UD-24 which starts easily as a low-compression gasoline engine and after a short warm-up period is shifted to full diesel operation by means of a single lever. This portable has all the features used on the KA-Series Mobil-Air compressors in sizes from 105 to 500 cu. ft. per minute. The new Floating-Speed regulator slows down the compressor to the lowest practical working speed that compresses just enough air to hold the pressure. Full 500 cu. ft. per minute capacity is delivered at rated 100-psi. pressure. *Ingersoll-Rand Co.*



IT'S NEW CHECK IT

30 HURRICANE PORTABLE AIR HEATER. Model HDG, especially designed for seismograph, drilling, pipe line, construction crews, and others who need an "on location" heater for heating, thawing, processing, or dehydrating uses. Unit is entirely self-contained, carrying its own fuel supply in I.C.C. cylinders. Features heavy-duty blower, air-cooled gasoline engine, temperature control, complete safety equipment, and a burner which utilizes any type gas. Standard models in several discharge capacities with temperatures to 250° F. Special models to 1,000 F. available. *Southwest Industrial Heating Engineers.*

IT'S NEW CHECK IT



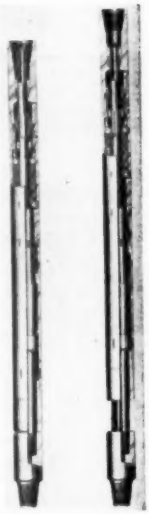
31 SPECIAL TANK VALVE. A special tank valve for oil-storage vessels is a split wedge, O S & Y gate, built for 230 psi. cold working pressure, and engineered with particular regard to safety of operation. The valve design has added wall thickness and reinforcing to resist tension and torsional stresses set up by the tank connecting line. The valve is supplied in sizes ranging from 6 to 24 in. with any desired trim. *Kerotest Manufacturing Co.*

IT'S NEW CHECK IT

32 JONES' SLIM-JOINT ⅞-IN. SUCKER RODS are being used successfully by producers in pumping some of their deeper wells which had been equipped with 2-in. tubing. Developed for this specific purpose, Slim-Joint rods can be run and fished in 2-in. tubing. They are available in the standard types of steel used to make Jones sucker rods. *S. M. Jones Co.*

IT'S NEW CHECK IT

33 STRAIGHT-PULL ADJUSTABLE JAR. Tripping mechanism does not depend upon friction for blow, but uses a flat-disk spring unit that permits jar to function with equal efficiency in mud, oil, or sand. Therefore, regardless of type of fluid in the well, jar strikes steady, unvarying blows at whatever adjustment the tool is set. Jar incorporates a rugged and positive screw-type adjustment that is keyed to allow an increase of approximately 5 tons per adjustment, eliminating danger of adjusting tool so high that jar cannot be tripped. Jar strikes its blow by direct raising and lowering of the drill string. It is ideal for all types of fishing operations and is also excellent for light drilling applications where a jar is required. It has a large circulation bore and is packed off against pressure leakage from both the inside and outside, enabling high circulation pressures. *Shaffer Tool Works.*



IT'S NEW CHECK IT

34 GRACO PAINTMASTER. This air-operated unit, a new type of paint supply pump and agitator, delivers a full supply of paint to the spray head at fluid pressures lower than are now commonly used. For this reason, "overspray" losses are cut sharply. A positive displacement, immersion-type gear pump, driven by a rotary air motor, delivers paint directly to the spray head, or pumps it through circulating supply lines. Since no air pressure is exerted upon the paint itself aeration is reduced to a negligible amount. Paintmasters pump paint and other finishing materials from original containers. An agitator at the base of the pump keeps paint thoroughly mixed, maintaining uniform viscosity at all times. *Gray Co., Inc.*

IT'S NEW CHECK IT

35 LONG-WAVE MINERALIGHT is especially efficient in oil analysis. The SL 3660 is the first ultraviolet lamp of the long-wave type that can be used on battery operation for field work. Lamp and battery case has hinged end which opens to provide space for daylight examination of samples and contains special circuit for operation of SL Mineralight on two 45-volt "B" batteries. *Ultra Violet Products, Inc.*

IT'S NEW CHECK IT

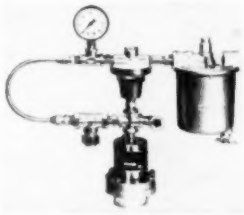
36 VERTICAL-TYPE LOW-PRESSURE OIL AND GAS SEPARATOR. Centrifugal force is generated and used as a powful aid to separation. A maximum amount of metal surface is provided for the capture of oil droplets and the release of gas bubbles, in the mist extractor at the top of the separator shell, and in the fluid stabilizer section, at the vessel's waist. Its vertical construction allows tangential oil entry, to generate immediate centrifugal force and thus utilize a proved method of separating fluids of different densities. *Sivalls Tanks, Inc.*

IT'S NEW CHECK IT

37 CONTINUOUSLY CONNECTED HANDWHEEL VALVE eliminates the necessity of the conventional bypass installation as it is powerful enough to operate the control valve manually, regardless of maximum instrument air pressure on the diaphragm or in opposition to the spring. It is therefore possible to position the valve plug by hand under any conditions, by merely turning the handwheel to the required position. The valve-plug position indicator automatically indicates the valve-plug position, and shows the setting of the travel stops. It shows at all times the per cent free travel of the valve plug, and exactly in what portion of the valve stroke the free travel can occur. It also shows whether the handwheel is in a neutral position. *Hammel-Dahl Co.*

IT'S NEW CHECK IT

38 F-C SERIES 5000 PNEUMATIC TRANSMITTER meets all of the requirements for measurements of pressure, vacuum, specific gravity, and level, or by means of two transmitters it is possible to measure differential pressure of flow. It employs the force balance method with a fixed nozzle system. This eliminates any levers, pivots, or fulcrums as the entire measurement system is dependent on the travel of the diaphragm towards or away from the nozzle. Accordingly, extremely high sensitivity, accuracy, and absolute repeatability are inherent in the system. Another important advantage is isolation of transmitting air pressure from measured variable by diaphragm. *Instruments, Inc.*

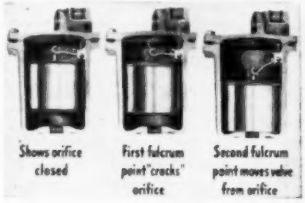


IT'S NEW CHECK IT

39 P. I. PLASTIC PIPE. A complete line of corrosion-resistant thermoplastic fittings and pipe range in sizes ⅜ to 3 in. Has a mirror finish which prevents scale or other forms of solid deposits from forming on pipe. Pipe and fittings may be used in transportation of oil, gas, air, or water. Light weight, ease in handling, and reduced loss from friction represent a great saving on salt water lines, lead lines, and other corrosive installations. Pipe and fittings are designed to withstand burst pressures of 300 psi. for 3-in. to 600 psi. for ⅜-in. Pipe is joined together by the use of coupling and a special material that welds pipe together in a leakproof joint. Pipe is chemically inert to most acids, alkalines, salts, and hydrocarbons, or acid and alkaline conditions found in soil. *Paldon Contracting Co., Inc.*

IT'S NEW CHECK IT

40 DUO-STEP LEVERAGE, a new development in steam-trap construction. By using a double fulcrum point and venting mechanism it is now possible to increase the drainage capacity of a trap so that it may handle twice the condensate formerly possible. *Clark Manufacturing Co.*

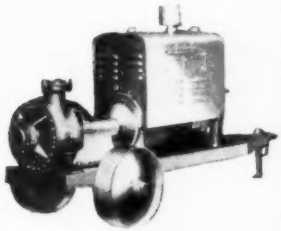


IT'S NEW CHECK IT

41 STANDARD 10-TON PER DAY OXYGEN PLANT. Plant output is 10 net tons per day of oxygen; produced at 95 per cent parity (10.5 gross tons per day) using normal atmospheric clean air as raw material. The small, compact unit is accommodated on 32 by 24-ft. floor space. Cold box, 10 by 8 by 32 ft., encloses three-quarters of the fractionating tower and all exchangers and cold piping. Features low-pressure and low oxygen cost. Only water and low-pressure steam and electricity are needed. No chemicals are required and no shutdowns for defrosting. Net weight of equipment, insulation, cold box (complete except foundations and shelter for equipment outside cold box) is 80,000 lb. *Stacy Dresser Engineering.*

IT'S NEW CHECK IT

42 SELF-PRIMING JETTING PUMP delivers 400 g.p.m. at 150-psi. pressure. Extremely high heads offer no difficulty to this pump. It is particularly adapted to pumping through long pipe lines that require high pressure. Other uses include fire fighting, bank washing, hydraulicking, ponding, watering down fills, and mud pumping during drilling operations. This new pump is primed by engine exhaust, a device which primes the pump rapidly (naturally dependent upon the suction lift). Available both in single stage models and multistage models. For extremely long pipe lines, these pumps will discharge their capacity in a thoroughly satisfactory manner. *Sterling Machinery Corp.*



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Among the Drilling Contractors

Davidson Elected Chairman Permian Basin Contractors

MIDLAND, Tex.—H. W. Davidson of the Odessa drilling firm bearing his name, has been elected chairman of the Permian Basin chapter of the American Association of Oilwell Drilling Contractors. He will succeed M. M. Conn, Trinity Drilling Co., Midland.

C. K. Lowe, W. H. Black Drilling Co., Midland, has been named vice chairman; and Don Johnson, Carl B. King Drilling Co., Midland, secretary. Gordon Oliver, University of Texas, has been appointed assistant secretary.

Slight Decline Reported In Operating Rotary Rigs

The number of rotary rigs operating in the United States and western Canada declined slightly during the week ended November 28 (latest report) after having climbed the previous week to a new high for the year. Active rigs reported totalled 2,227, or only 12 under the previous week's 1949 peak. There still are 234 more rigs running than before the upward trend in activity began 6 weeks ago.

ROTARY RIGS IN OPERATION*
(United States and Western Canada)

Area	Week ended 11-28-49	Change week ended 11-21-49	Change week ended 11-29-48
Gulf Coast	541	+ 7	— 83
W. Tex.-N. M.	667	—12	— 64
Ark.-N. La.-E. Tex.	159	— 3	— 27
Oklahoma	246	— 11	— 37
Kansas	131	— 6	— 8
Illinois-Eastern	145	— 4	— 5
Rocky Mountains	107	— 5	— 55
Pacific Coast	146	— 2	— 46
Total U. S.	2,142	12	—187
Western Canada	85	0	— 8
Total	2,227	—12	—179

*Courtesy Hughes Tool Co.

D & E Co. to Move Home From Dallas to Abilene

Headquarters of Drilling & Exploration Co., Inc., now located at Dallas, will be moved to Abilene, Tex., J. E. Brantly, president, announces. The move will be made as soon as a new office building, which the company will build in the latter city, is completed. This is expected to be early next spring. The transfer will involve both domestic and international departments. The company currently is operating 35 drilling rigs.

Noble Drilling Co., Tulsa, is drilling for Amerada Petroleum Corp. at

Daylight and evening tour crews on a steam rig which Al Buchanan Drilling Co., San Antonio, is operating for Plymouth Oil Co. in the East White Point field, San Patricio County, Texas Gulf Coast. Bottom row, left to right: E. A. Walton, toolpusher; Jack Simmons, driller; S. H. Neely, derrickman; Clyde French, fireman; A. L. Green and Theodore Short, floormen. Top row, same order: H. C. Tice, driller; W. A. Ehlert, derrickman; R. C. Brown, fireman; H. C. Fowler and P. P. Sommermeyer, floormen

4 Unit, 7-36n-77w, the latest test started in the Sage Creek area, Natrona County, Wyoming. Another Noble rig is on the same operators' 3 Unit.

Earl Wakefield Drilling Co., Wichita, has a rig running for Amcan Oil Corp. and Texaco Exploration Co. on a wildcat test in the Glen Park area, 8 miles southwest of the Leduc field, southwest Edmonton, in central Alberta Province, Canada.

Loffland Brothers Co., Tulsa, has the contract for a well which Rio Bravo Oil Co., Ltd. (Superior Oil Co.) is starting in the Excelsior area, northeast of Edmonton, Alta., Canada, where a new Devonian field is being opened by Imperial Oil, Ltd. The Rio Bravo location is for 5-3 Carruthers, in LSD 5, 3-56n-24w4, ½ mile south of the Imperial discovery.

Johnson & Flesher Drilling Co., Oklahoma City, is keeping a rig busy for Ray P. Diehl in the recently opened Northwest Tyron pool, Lincoln County, Oklahoma. The rig has just completed its third well in the pool, and is being moved to its fourth location. The pay zone is the Red Fork sand around 4,150 ft.

Sam Richardson, El Dorado, Ark., is making hole on a deep test for C. H. Murphy & Co. in the old South El Dorado field, Union County, Arkansas. The well is 1 Pepper, in 32-18s-15. Contract is for 7,900 ft.

Puckett Drilling Co., Wewoka, Okla., is drilling on a 2,600-ft. contract at Otha H. Grimes 1 Burkett, in the Greasy Creek district, central Hughes County, Oklahoma. Location is in 34-8n-10e.

Christie Stewart, Wichita Falls, Tex., has a rig running for An-Son Petroleum Corp. at 1 Pearcy-Slusher Unit, located on the west flank of the Knox pool, Grady County, Oklahoma. Hole is projected to 2,800 ft.

Helmerich & Payne, Inc., Tulsa, has the contract for a projected 9,700-ft. wildcat test to be drilled for Honolulu Oil Corp. in Lamar County, Mississippi. The location is 4 miles west of the Coral townsite in 22-5n-16w.

Brinkerhoff Drilling Co., Casper, Wyo., has a contract to drill for Ohio Oil Co. at a location ¾ mile southeast of the Redwater field, northeast of Edmonton, in Alberta Province, Canada. The location is on a 160-acre Crown lease which Ohio recently acquired for a consideration of $420,000.

Peterson Drilling Co., New Orleans, is starting a wildcat test for McDaniel Brothers at 1 Crothers, C SW SW 27-9n-8e, 2½ miles east of Lomarque, Concordia Parish, eastern Louisiana. Hole is contracted to 9,300 ft.

Young Brothers Drilling Co., Long Beach, is drilling for Sun Valley Oil Co., Inc., at 1 Berry, a wildcat test in 8-4n-15, Saugus area, Los Angeles County, California.

Commonwealth Drilling Co., Calgary, has been awarded contract by California-Standard Co. for a Madison lime exploratory test to be drilled in the Claresholm area, 70 miles southeast of Calgary, in southern Alberta Province. It is 45 miles southeast of the Turner Valley field.

Eugene Jordon, Oklahoma City, contractor on Alpha Petroleum Corp.'s new discovery well now being completed south of Langston, Logan County, has been given the contract for a second well for the same company. The latter is a location north of the discovery, which is producing from Misener sand around 5,090 ft.

Wolfe Drilling Co., Tulsa, has a rig working for T. A. Manhart at 1 Palmer, in 27-10n-9e, a 3,000-ft. exploratory test located a mile northwest of the Papoose pool, in Okfuskee County, Oklahoma.

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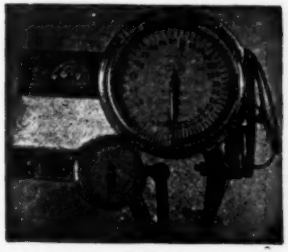

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PIPE LINES

Montana-Dakota Project Is Given FPC Approval

MONTANA - DAKOTA UTILITIES CO. has been given Federal Power Commission authority to lease and operate a natural-gas pipe line, to be built by Montana-Wyoming Gas Pipe Line Co., extending from the Worland gas field in Wyoming to the Cabin Creek compressor station of Montana-Dakota north of Baker, Mont., which by the end of 1951 will make available an additional 25,000,000 cu. ft. of gas daily to Montana-Dakota's customers in Montana and North and South Dakota.

Also authorized by the commission was the proposal of Montana-Dakota to construct two branch lines extending from the Wyoming to Montana line, one a 1½-mile line, connecting with its existing 8-in. pipe line at Miles City, Mont., and the other, a 3-mile line, connecting with a distribution system to be built at Forsyth, Mont.

Application for FPC authorization to construct the facilities was filed jointly by Montana-Dakota and Montana-Wyoming. However, the commission found that Montana-Wyoming will not become subject to FPC jurisdiction by reason of the construction and ownership of the Wyoming-to-Montana pipe line.

Facilities which Montana-Wyoming will build and lease to Montana-Dakota include the 340-mile, 12¾-in. line extending from the Worland field in Washakie County, Wyoming, to Montana-Dakota's Cabin Creek compressor station in Fallon County, Montana; and a combination gas compressor, dehydration and sulfur-removal plant near the Wyoming origin of the line. Estimated cost of all facilities is $9,089,085.

The 25-year lease period may be renewed or extended by Montana-Dakota for 10 years beyond October 1, 1975, FPC ruled, to assure customers of gas service. In the event Montana-Wyoming sells the Worland line, Montana-Dakota shall have the right to purchase the facilities at depreciated original cost.

Meanwhile, FPC has adopted, with modifications, a presiding examiner's decision directing Montana-Dakota Utilities to perform "common carrier" natural-gas transmission service for Mondakota Gas Co. The decision ordered Montana-Dakota to connect its transmission facilities with a pipe line of Mondakota near a Montana gas well, and to accept up to 500,000 cu. ft. of gas daily for transportation to the Eastern Clay Products Co. plant near Belle Fourche, S. D. The order was modified so as to include in the text a specific reference to Montana-Dakota's branch 1½-in. transmission line which FPC directed to be operated at main-line pressures.

Cities Service Seeks to Build New Line in Kansas

Cities Service Gas Co. Oklahoma City, has asked Federal Power Commission to authorize construction of approximately 42.6 miles of natural-

Drilling shot holes with two double drills operated by 500-ft. air compressor at spread of Oman-Fulton & Brodie in construction of 22-in. line near Wartburg, Tenn., for East Tennessee Natural Gas Co.

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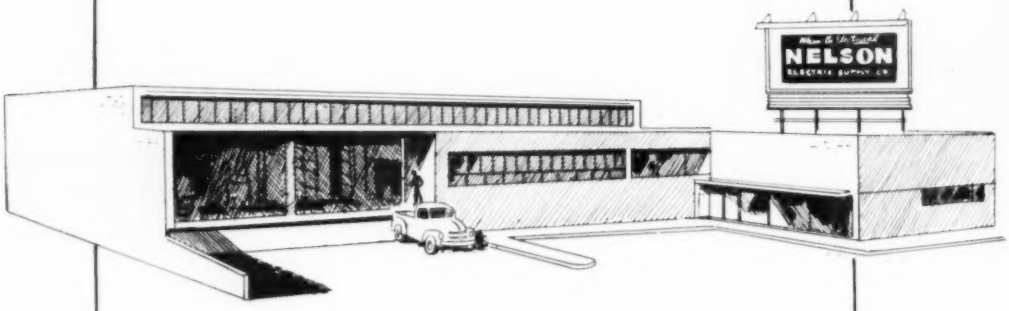

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gas pipe line, and to approve the abandonment of about 127.3 miles of pipe line, all in Kansas.

Estimated cost of the construction is $829,940. The company estimates salvage credit of the facilities proposed to be abandoned and reclaimed at $440,200, with the cost of retirement amounting to $286,365. Cities Service plans to finance the construction from its own funds.

The application says that the proposed construction will provide greater capacity to meet increased demands in the Wichita-Newton, Kans., area. The proposed abandonment, the company said, is necessary because of the excessive maintenance and leakage on the line which now serves that area.

Canadian Line's Crude-Oil Flow Set at 70,000 Bbl.

Approximately 70,000 bbl. of Canadian crude oil will move daily through a 690-mile pipe line which is being constructed between Regina, Sask., and Superior, Wis., by Interprovincial Pipe Line Co., subsidiary of Imperial Oil Co., Ltd.

From Superior the crude will be shipped in bond 750 miles to a Sarnia, Ont., refinery, according to the U. S. Department of Commerce, Office of International Trade. Some 350 miles of the line will be operated in the United States by a newly formed subsidiary of Interprovincial, the Lakehead Pipe Line Co., Inc., between Gretna, Man., on the border, to Superior.

The Regina-Superior line is to be an extension of a 460-mile line which Interprovincial is constructing between Edmonton and Regina. Its total capacity will be 95,000 bbl. daily, of which about 25,000 bbl. will be tapped at the Regina refinery, and the remainder sent on to Superior

Hearing Under Way on Two Applications for Gas Lines

Federal Power Commission opened a consolidated hearing December 8 in Washington, D. C., on two applications relating to the construction of pipe-line facilities which would carry additional natural gas for distribution in Oswego, Onondago, Madison, Oneida, Fulton, and Herkimer counties in New York State. About 4,100,000 cu. ft. per day of this gas is proposed to be distributed in parts of Michigan and Oneida counties in place of manufactured gas and for mixing with manufactured gas in parts of Oneida, Herkimer, and Fulton counties.

One application was filed by New York State Natural Gas Corp., and the other, a joint application, by Central New York Power Corp. and New York Power & Light Corp.

New York State Natural is proposing to build facilities, at an estimated

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One pipeline spread of Latex Construction Company laid and took-up 418 miles of pipe during our fiscal year ending Nov. 30, 1948 . . . demonstrating the value of combining years of experience and specialization with a well integrated organization for more efficient pipeline construction.

The mileage of pipeline work done by this one spread was divided as follows:

Miles of Pipe laid, 16" and larger 306
Miles of Pipe laid, 8", 10" and 12" . . . 62
Miles of Pipe taken-up and reconditioned . . 50

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HOUSTON, TEXAS ATLANTA, GA.

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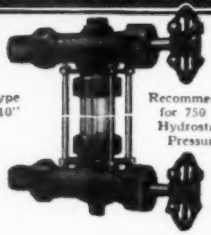

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Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

cost of $32,000, necessary to deliver the additional gas to Central New York Power. The latter company plans to construct a 16-mile line connecting with New York State's system at the existing point of connection on the Otisco - Onondago town line in New York State and extending north and east to a connection with its own existing system pear Syracuse. Estimated over-all capital cost of these facilities is $972,000, of which $965,500 will be expended by Central and the remaining $6,500 by New York Power.

Pipe Laying Progresses For Mid-Valley's Texas-Ohio Line

Mid-Valley Pipe Line Co. (Sun and Sohio) has already laid more than 100 miles of pipe for the company's 1,315-mile system to consist of 1,163 miles of 20 and 22-in. main line from Longview, Tex., to Lima, Ohio, and 152 miles of 6, 8, and 12-in. gathering lines.

During the 45 days that work has been in progress, nearly all construction has been in the section south and west of Henderson, Tenn., where the project is supervised by Sun Pipe Line Co.'s organization. In this section substantial deliveries of pipe were made before the steel strike. Work in the section north of Henderson is under the direction of Sohio Pipe Line Co.

By the end of last week, two Latex Construction Co. spreads working on the main line had laid 60 miles of 20-in. and a Latex spread on the gathering line had laid 12 miles of 6-in., 20 miles of 8-in., and 10 miles of 12-in. At the Mississippi River crossing two lines are being laid by another Latex spread.

11 Per Cent Increase in Volume Handled by Lines

Volume of the three principal refined petroleum products handled by pipe lines ranged up to 11 per cent higher the first 9 months of this year than in the same period the previous year, according to U. S. Bureau of Mines.

Products deliveries from lines amounted to 252,424,000 bbl., or an increase of 11 per cent over the same 1948 period. September deliveries totaled 29,129,000 bbl., up 13 per cent. Products turned into lines in the same period amounted to 254,166,000 bbl., an increase of 10.4 per cent, and products turned into lines in September amounted to 28,943,000 bbl., up 13.7 per cent, the bureau reported.

Of the total volume of products delivered, 81 per cent was motor fuel, 13 per cent was distillate fuel oil, and 6 per cent was kerosine. In the same period last year ratios were 79 per cent motor fuel, 15 per cent distillates, and 6 per cent kerosine.

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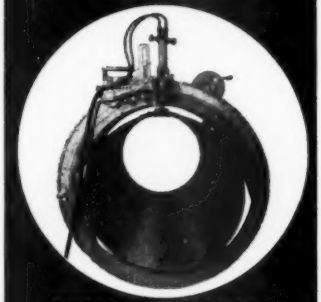
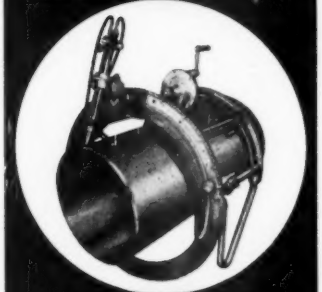


EQUIPPED WITH OUT-OF-ROUND ATTACHMENT

Machines to cut and bevel 16" pipe and over are furnished with out-of-round attachment.



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Machines to cut and bevel 14" pipe and under are furnished with Standard Torch Holder.

Crose pipe cutting and beveling machines are sturdy light weight construction made from cast aluminum. Simple operation. This machine has a split ring which enables it to be installed over the pipe for cut outs. The out-of-round cutting attachment allows you to cut true bevels on bent or egged pipe. Machines to cut and bevel pipe up to and including 36 inches in diameter are available for immediate delivery.

WRITE FOR BULLETIN BM1001

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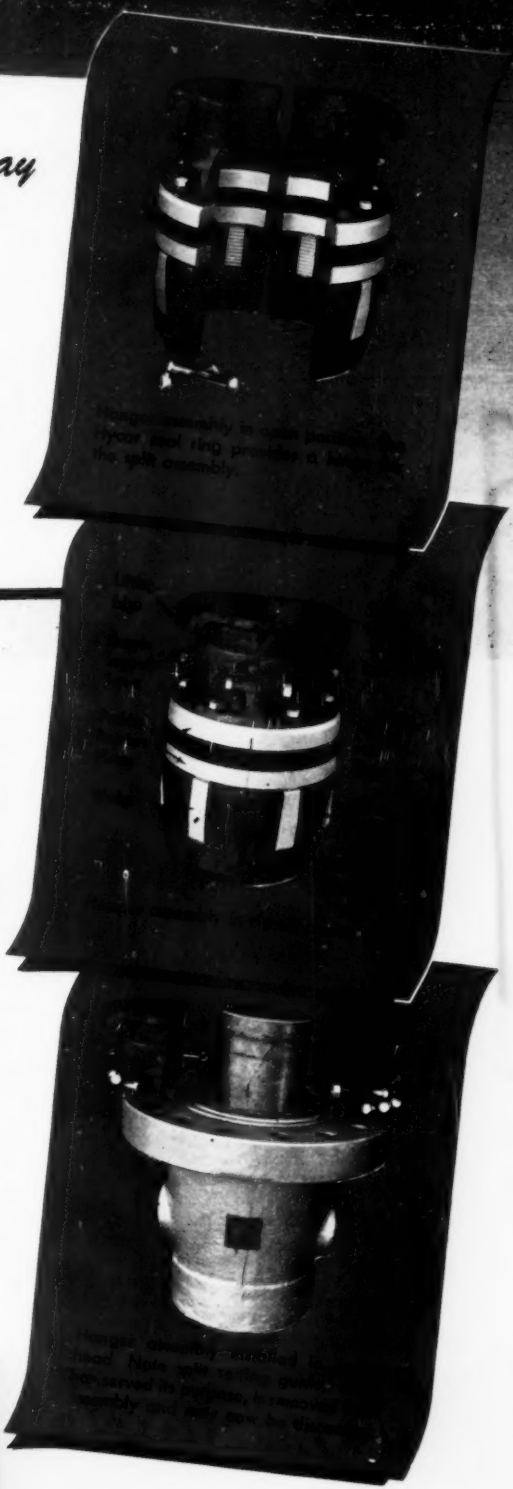

• Wrap-around design; may be dropped or lowered through preventers from derrick floor, eliminating danger of lifting preventers to install hanger. • Seals positively and automatically when pipe is hung on slips. • Setting guide prevents hanger becoming "cocked" on pipe and assures easy setting. Also permits fastening hanger assembly around pipe at any desired point if it is desirable to lower hanger to its seat while running casing. • Packing may be tightened if necessary after initial automatic setting. • No special casing head housing required . . . fits any Cameron head.

The Cameron Type "A" Automatic Hanger assembly consists of 6 slip segments which are attached to the two halves of a hinged packing assembly, with a setting guide on top. Each slip segment carries a wedge which, in the free position, projects slightly beyond the tapered surface of the slips. The bottom of these wedges bear on inclined planes in the slip segments and the top of the wedges bear on the lower packing retainer plate. Upon reaching its seat in the casing head, the outer taper on the wedges contact the casing head taper and the slip teeth engage the pipe. As pipe load is slacked off onto the hanger the wedges are forced inward and upward on the inclined planes, forcing the lower packing retainer plate upward to automatically compress the packing.

Complete details on this unique casing hanger are carried in your Composite Catalog, or literature will gladly be sent on request.

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Other exclusive Foxboro Refinements . . . *Sure-Seal Check Valves* positively prevent mercury losses; *Pressure-Tite Bearing* eliminates stuffing box and packing; *Float in High Pressure Chamber* minimizes temperature errors.

Portable Flow Meter Installation on Portable Well Tester

NO WONDER there are so many of these portable flow meters in use! They're designed for portability . . . light, easy to lift and lug . . . yet they're full-sized, standard Foxboro Instruments. These instruments are primarily used for measuring and checking service on pipe lines.

Although they weigh only 35 pounds, they're ruggedly constructed. Their frames are of stout aluminum . . . well-balanced . . . and sturdily supported. Meter chambers are forged steel for 500 or 1000 lbs. working pressure. Differential range is 100" . . . static range as desired.

This mercury float type differential meter affords the best possible protection against overranging and loss of mercury. It is least subject to errors caused by temperature changes. Its calibration is simple . . . testing and checking are less frequently required because there is no occasion for spring-fatigue. Get all the facts. Write **The Foxboro Company, 182 Neponset Avenue, Foxboro, Mass., U. S. A.**

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NATURAL GAS

Northern Natural Asking Judgment Against Republic

Northern Natural Gas Co., Omaha, has filed suit in district court at Hugoton, Kans., against Republic Natural Gas Co., Dallas, asking a declaratory judgment on a 20-year contract. Petition states that Republic has furnished Northern Natural gas for the Omaha district at a Hugoton field gate east of Hugoton under the contract which began December 21, 1945.

The petition further sets out that on October 28 Republic served notice on Northern that it was exercising its option to terminate the agreement. Republic said it based its action on Northern's failure "to take and pay for 1,508,825,000 cu. ft. of gas in the period between July 1, 1947, and June 30, 1948, or to pay therefore at the rate of 6 cents per thousand cubic feet within 25 days following July 30, 1948."

Amount of money thereby directly involved is $90,529.50, the nonpayment of which, Republic stated, constitutes breach of contract. Northern filed its petition within 25 days after receipt of the notice and posted its certified check for the above amount with the district court clerk in Hugoton.

Northern Natural contends further that it has paid Republic Natural for all gas delivered during the contract year and has lived up to all terms of the 20-year contract.

Court Dissolves Injunction On Guaranteed Gas Supply

A Detroit federal court had no jurisdiction in proceedings between Michigan Consolidated Gas Co. and Panhandle Eastern Pipe Line Co. governing the natural-gas supply to Ann Arbor, Mich., the Sixth United States Circuit Court of Appeals ruled recently.

The appelate court reversed a district-court order and remanded the case for further proceedings. In the original hearings at Detroit, Consolidated has been granted an injunction preventing Panhandle from reducing the supply to Ann Arbor.

Consolidated had a contract, terms of which called for Panhandle to deliver 2,000,000 cu. ft. of gas per day. Ann Arbor's normal supply, however, was more than 5,000,000 cu. ft. daily. Fearing that this would be raised, Consolidated got an order from Federal Power Commission for delivery of 5,782,000 cu. ft. of gas. The appelate court said the lower court had no jurisdiction, since Consolidated could get relief from FPC itself.

Atlantic Seaboard's Gas Tariff Proposal Suspended

Federal Power Commission has suspended, pending hearing and decision, Atlantic Seaboard Corp.'s proposed FPC gas tariff, First Revised Volume No. 1, and statements, filed concurrently, identifying provisions of contracts now filed with FPC which would be continued in effect under the new tariff.

The commission scheduled a hearing to commence January 11, 1950, in Washington, D. C., on the "lawfulness" of the changes proposed to be effected by the tariff and statements.

FPC said that Washington Gas Light Co. and Washington Gas Light Co. of Maryland, Inc., filed protests against certain changes which would be effected if the tariff and the statements were allowed to take effect.

The protests related to changes respecting the term of and notice required to be given in the event either party proposes to terminate a contract or service agreement; priority as to service to Washington Gas Light Co.; variations in heat content of the natural gas to be supplied; remedies available to Washington Gas Light Co. in the event of Atlantic's failure to supply its demands; the rsponsibility of either Washington Gas or Atlantic for its negligence in the event claims are filed against the other party as the result of negligence or default; the introduction of a "force majeure" clause; and the failure to include a provision binding Atlantic and the Maryland company to the continued performance of their contract by successors or assigns of either.

Atlantic Seaboard, which has main offices in Charleston, W. Va., had proposed to make the new tariff effective on December 1.

Colorado Interstate Gas' New Motion Rejected by FPC

Federal Power Commission has denied Colorado Interstate Gas Co.'s motion for modification or stay of the FPC order and decision of November 2 which directed changes in both volumes of the company's proposed natural-gas tariff. *(The Oil and Gas Journal, November 17, page 116).*

Colorado Interstate contended that since FPC had ordered the revisions to be filed by December 1, the company would be required to file the tariff on about the same date that the 30-day period for filing an application for rehearing expires. Pointing out that the commission then has another 30 days within which to act upon an application for rehearing, the company said that unless the time for filing the tariff is extended, it will be required to comply with the FPC's decision and order before it has an opportunity to seek court review.

The company therefore asked FPC to either stay the operation of the order, or to extend the time so that the company would have 120 days within which to file the required new schedules.

Hope Natural's Motion to Modify Tariff Order Denied

A motion filed by Hope Natural Gas Co., Clarksburg, W. Va., requesting a Federal Power Commission order modifying the FPC order of October 31 suspending the firm's proposed tariff changes has been denied by the commission. The new proposal would have increased Hope's rates for wholesale natural-gas service by approximately $1,963,400 per year.

Hope asked FPC to vacate that part of the order which specifically suspended the tariff, and requested that the proposed rate increase be permitted to become effective as of November 1. The firm proposed that, as a condition of the requested order, it would agree to terms and conditions to be prescribed by FPC which would assure a refund to Hope's customers of all amounts in excess of the rates ultimately fixed by the commission.

Natural Gasoline

New Texas Cycling Plant to Be in Operation in March

HOUSTON.—Reports indicate that the $3,500,000 cycling plant of Coastal Refineries, Inc., and Mayfair Minerals, Inc., near McAllen, Tex., will be in operation by March of next year.

This information was contained in the annual report to stockholders by Petroleum Heat & Power Co. Petroleum Heat owns majority stock interest in Coastal. The new plant is designed to process 75,000,000 cu. ft. of gas daily. About 20,000,000 cu. ft. of this total is to be sold as dry gas to local markets, and the remainder is to be injected back into the reservoir after the liquid components have been extracted.

Gasoline Plant Construction Corp. of Houston is building the new plant.

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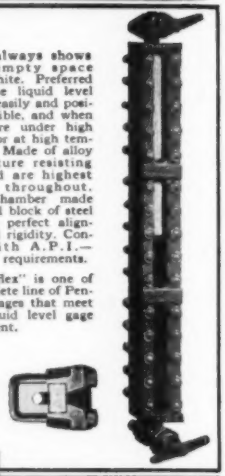

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REFINING

First Cat Cracker for East Texas Planned by McMurray

The first fluid catalytic cracking refinery installation for the East Texas area is being planned at McMurray Refining Co.'s plant at Tyler.

Marvin H. McMurray, president of the firm, said that negotiation has been completed with Universal Oil Products Co., Chicago, for the engineering, design, and construction of the unit.

Completion is expected in the fall of 1950, and will climax an expansion and modernization program started by the McMurray firm 18 months ago.

A gas-concentration unit and a feed preparation and cycle-oil cracking unit will be constructed at the refinery simultaneously with the catalytic cracking unit. The gas-concentration system will extract propane and butane, and at the same time prepare stock for the catalytic polymerization unit recently placed in operation. The feed-preparation system is designed to give maximum flexibility of the products selection.

McMurray's entire system will have a daily capacity of approximately 5,000 bbl. The firm's recent expansion program in addition to the polymerization unit includes a modern crude-distillation unit, a new steam plant, a research and development laboratory and general office building.

Report Issued on Sulfur Compounds Found in Oil

The U. S. Bureau of Mines has issued a new report in a series listing data on the physical properties of sulfur compounds most likely to be found in petroleum and its products as part of a cooperative research program designed to increase utilization of high-sulfur crude oils and thus conserve better-grade crudes.

Based on work done in cooperation with the University of Wyoming at the bureau's petroleum and oil-shale experiment station at Laramie, Wyo., the report identifies the most common sulfur compounds and provides information useful in devising methods for removing these objectionable impurities.

To refiners and manufacturers of gasoline, the removal of complex sulfur compounds from crude oils has increased in importance rapidly in recent years with the increased demand for petroleum and the need for utilizing less desirable crudes, the bureau report points out. Information included also is considered of value in the development of a synthetic - liquid - fuels industry, since such fuels, manufactured from natural gas, shale oil, and coal, also contain sulfur compounds which must be effectively removed.

Revised and additional data taken from Chemical Abstracts for 1946 and 1947 on boiling points, refractive indices, densities, and freezing points are included in the report. In addition, tables show refractive indexes for wave lengths of light other than the sodium D line, surface tensions, viscosities, and values for derived functions, such as refractivity intercepts, specific dispersions, specific refractions, and parachors. A suggested nomenclature of sulfur compounds also is discussed.

A free copy of the publication, Report of Investigations 4566, "Sulfur In Petroleum: III. Selected Physical Properties of Some Sulfur Compounds," may be obtained by writing to the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa. The report was prepared by R. Vernon Helm and William E. Haines, petroleum chemists, and John S. Ball, refinery engineer, at the petroleum and oil-shale experiment station at Laramie.

A.P.I.'s Midyear Refining Meeting to Be in Cleveland

The 1950 midyear meeting of the Division of Refining of the American Petroleum Institute will be held in Cleveland, May 1-4, and sessions will be held in the Hotel Cleveland.

Chester F. Smith, vice president for refining, announced that the program, in addition to the usual committee meetings, will have seven technical sessions covering corrosion, training, waste disposal, automotive fuels, analytical research, new processes, and refinery maintenance.

The program committee, which planned details of the meeting, is under the chairmanship of W. M. Holaday, manager of research and development for Socony-Vacuum Oil Co., Inc., New York.

W. T. Gunn, director of the Refining Division, announced that those interested in submitting papers for the various sessions should communicate with him at the American Petroleum Institute headquarters, 50 West 50th Street, New York 20, N. Y. Deadline for all papers is March 1.

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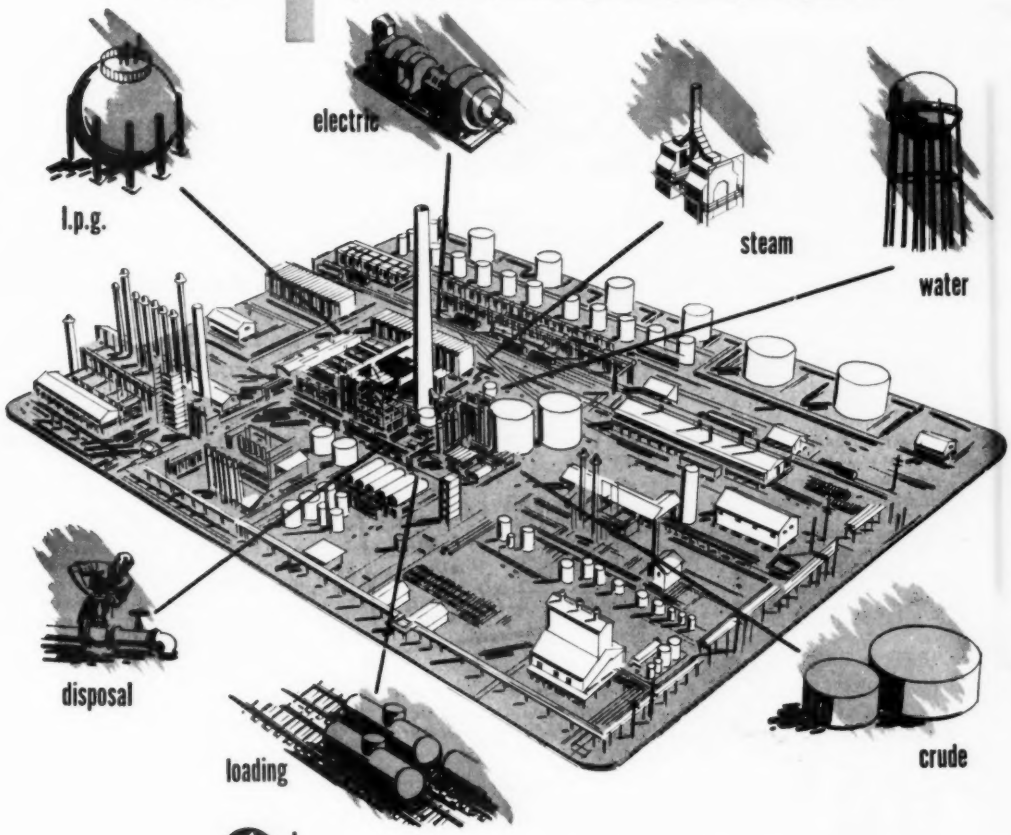

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Waste-Disposal Symposium Highlight of A.I.Ch.E. Meet

An industrial waste disposal symposium and technical discussions of process research, fractionation, and fluidization interested refining engineers attending the forty-second annual meeting of American Institute of Chemical Engineers. A series of 10 papers delivered in two waste-disposal sessions covered all phases of problems dealing with prevention of water and air pollution.

In his paper entitled "Process Research Engineering, Its Purpose and Procedure," Joel H. Hirsch of Gulf Research & Development Co. discussed ways and means for making the most of industry's current $500,000,000 research program. Theory of the fluidized state was presented by John Bowman of Mellon Institute. The factors which govern the elutriation rates of fines from fluidized systems were described by Max Leva of the U. S. Bureau of Mines, whose data were analyzed to show that a definite equilibrium exists for given fluid rates between the concentration of fines in the dilute and dense phase respectively.

R. C. Scofield of Pan American Refining Corp., Texas City, Tex., reported on performance characteristics of a new form of oriented multilayer tower packing. In commercial use in fractionating towers up to 4 ft. in diameter, he reported that the packing has both higher capacity and improved HETP as compared with conventional bubble cap towers. Savings amounting to as much as a sixfold reduction in tower size may be realized in principal cost items of towers, he stated.

Humble's New Brownsville Plant Now in Operation

Humble Oil & Refining Co.'s Valley Products Terminal at Brownsville, Tex., for receiving and distributing of company products in the Rio Grande Valley, is now in operation. It is the first new unit to be completed at the Port of Bownsville since opening of the last section of the Intracoastal Canal to the tip of Texas.

The new plant will receive gasoline and other products by barge through the canal direct from the firm's Baytown, Tex., refinery at Houston.

Facilities at the terminal include pipe lines to unloading docks, a large warehouse, two storage tanks of 20,000 and 30,000-bbl. capacity for gasoline, two 10,000-bbl. tanks for kerosine and diesel fuel, a truck-loading rack, truck garage, railroad spur, and auxiliary equipment. It will serve as the local distribution point for products in Brownsville as well as being a central point from which trucks will supply the entire valley area.

No Estimates Made of Fire Damage at Humble Refinery

HOUSTON.—Damage estimates and future plans have not yet been announced by Humble Oil & Refining Co. following the fire which swept the spent acid concentrator area of the company's 225,000-bbl. Baytown refinery, the nation's largest.

The flash fire is believed to have been started by a lead burner's torch, but this has not been positively confirmed. One official commented that it is "not likely that the loss will be too great." Operations are continuing at the huge plant and it is not believed they have been seriously curtailed throughout the refinery as a whole.

There were no injuries to employes as a result of the fire. It started about 11:10 p.m. and was under control by midnight.

New Book to Be Published

A book dealing with Pennsylvania oil reserves will be published by the Pennsylvania Topographic and Geologic Survey. Containing results of a study made by William S. Lytle, of the survey, the report will cover each of the state's 164 fields separately. The survey was sponsored by the I.O.C.C. and the Independent Stripper Well Association and is recommended to engineers concerned with secondary-recovery operations.

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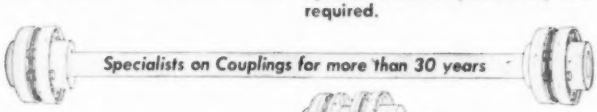

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Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
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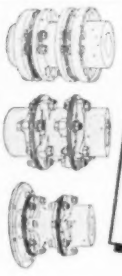

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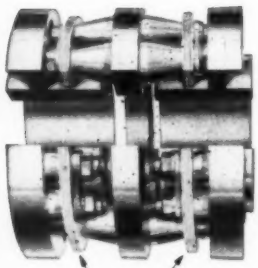

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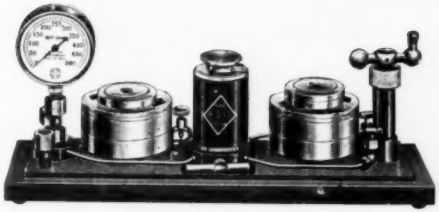

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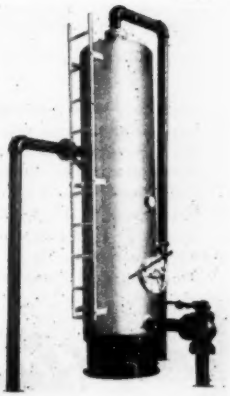

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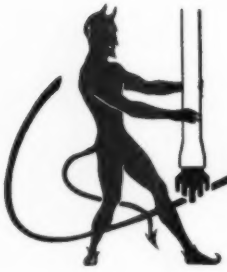

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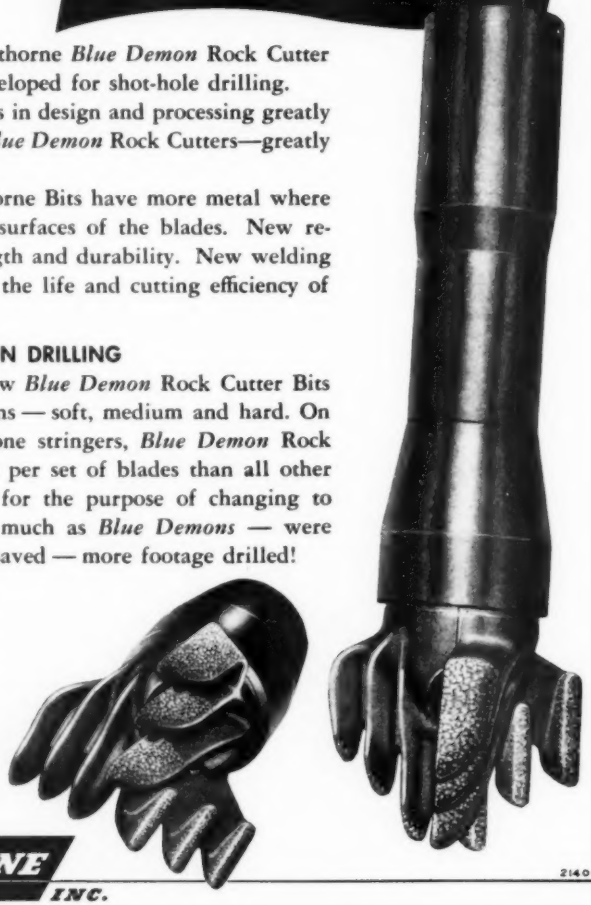

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Exploration and Drilling

Scurry County Reef Play Extension?

THE possibility of the Scurry County reef play jumping southwest into Borden County looks a lot more likely, as the result of tests in Amerada Petroleum Corp. 1 Von Roeder, about 4 miles west of the nearest Canyon production in Sharon Ridge field, in SE SW Section 103, Block 25, H&TC Survey, Borden County.

From an elevation of 2,368 ft., the Von Roeder test topped the Canyon reef at datum —4,467 ft., probably below the water level in nearby Sharon Ridge wells, but in drill-stem tests found no water higher than —4,542 ft. maximum, or at some point between —4,542 ft. and 25 ft. lower. Incidentally the reef top was 228 ft. higher than in Amerada's 1 Canning, a dry hole about 2 miles to the northwest.

Four drill-stem tests were made. The first at datum interval —4,454 to —4,582 ft., open 4 hours, had gas in 2 minutes, estimated at 30,000 cu. ft. per day rate, recovered 120 ft. of gas-cut mud, 180 ft. of oil-and-gas-cut mud, estimated 40 per cent oil content. The second test at datum interval —4,466 to —4,507 ft., open 4 hours, had gas in 5 minutes, estimated at rate of 124,000 cu. ft. per day for first hour, dropping to estimated rate of 6,000 cu. ft. per day in 1½ hours, no fluid to surface. Recovery was 91 ft. of gas-cut mud, 91 ft. heavily oil-and-gas-cut mud, 243 ft. of extra heavily oil-and-gas-cut mud, 30 ft. of free oil, gravity 42.5°. When drill pipe was being pulled, it unloaded fluid for 2 minutes, then flow died.

The third test at datum interval of —4,507 to —4,542 ft. was only 1 hour, and recovered 43 ft. of drilling mud. The fourth test, open 4 hours, at datum interval of —4,542 to —4,567 ft., recovered 212 ft. of mud and 3,276 ft. of salt water. That puts the water level probably at somewhere in the interval.

Regardless of whether some sort of a well is finally made of the Von Roeder, it steps up the interest. As of now, most geologists figure that if the Von Roeder doesn't make a well, another test not too far south ought to produce. It has already come up 228 ft. from the Canning test in a little over 2 miles.

The big problem is how to interpret what is happening to the reef trend and particularly the trend of oil saturation. The difference in water level between the Von Roeder well and the Sharon Ridge producers is the puzzling factor. The water level at Sharon Ridge is probably somewhere around —4,450 ft., or 15 to 20 ft. higher than the top of the reef in the Von Roeder; and perhaps as much as 100 ft. higher than the probable water level in the Von Roeder.

There has been speculation for some time that the Scurry County trend would continue in a gentle arc toward the southwest, crossing the county line into Borden County. Perhaps it will, but with gaps in between and with new fields with lower water levels. Why? Who knows? Or perhaps this marks a new trend of reef production; one which may run more or less due east-west. The shape of Amerada's acreage block of several sections might indicate that its play had been made on some such interpretation.

Then there are the numerous speculations and theories about how the Scurry trend might end and another east-west trend be found somewhere in the vicinity of the Borden-Howard county line. *(See The Oil and Gas Journal, September 29, 1949, page 117, and November 10, 1949, page 397, for some previous discussions of these theories).*

There is this much about the Von Roeder water level for the east-west trend advocates to talk of. The reef top at Vealmoor is around —5,100 ft. and in the Goode at around —5,200 to —5,300 ft. in accordance with what would be expected of regional west dip. So the arguments will be on, and various people will back their respective theories with test wells, until the answer is known. Most of them are pretty sure there is a lot of reef oil to be found west of the Scurry County line. *Charles J. Deegan.*

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

TEXAS GULF COAST.—McCarthy Oil & Gas Corp. 1-A Schiller, dual sand wildcat discovery in the New Ulm Area of Austin County, flowed 450 bbl. of 39°-gravity oil daily through a 12/64-in. choke from perforations at 9,467-85 ft., with 1,550 psi. tubing pressure. In the upper sand at 9,048-58 ft., the well flowed 300 bbl. of 41.1°-gravity oil daily through 16/64-in. choke with casing pressure of 500 psi. A new sand in West Columbia field, Brazoria County, has been found at The Texas Co. 37 J. G. Phillips, et al. The new discovery is producing 181 bbl. of 29.7°-gravity oil daily through perforations at 6,180-6,210 ft., some 500 ft. lower than most other production in the area. Hole is bottomed at 6,531 ft.

WEST TEXAS.—Superior Oil Co. completed its 2 Jim Plaster, "tight" wildcat in west central Mitchell County, extending Ellenburger production 2 miles north and 1 mile east of its Dockery discovery. Initial potential was 338 bbl. Ted Weiner 1 Floyd, prospective second well for Tex-Harvey field, Midland County, east offset to the discovery, swabbed and flowed about 25 bbl. of fluid hourly, said to be mostly clean oil, after shooting the Sprayberry sand at 7,610-7,960 ft. with 820 qt. of nitro. A northwest offset, Weiner 1 Hugh Dixon, had total depth at 7,515 ft. and was waiting on standard tools.

NORTH TEXAS.—Five miles southeast of Archer City, J. J. Lynn 2 DeMoss, 933 ft. southeast of No. 1, completed flowing 320 bbl. of 42°-gravity oil a day, 16/64-in. choke, from pay around 3,602-10 ft., total depth. Flowing pressures were 650 psi. on casing and 400 psi. on tubing.

LA.-ARK.

Deep Wildcat Begun In Concordia Parish

SHREVEPORT—Start of a 9,300-ft. wildcat was disclosed this week in northern Concordia Parish, just east of the town of Lamarque, in the SW SW 27-9n-8e. The proposed test is to be drilled as the McDaniel Brothers 1 B. C. Crothers, with support reportedly coming from Stanolind Oil & Gas Co., Gulf Refining Co., and Tide Water Associated Oil Co. Location is on a gravity prospect. It was drilling below surface casing on first report.

R. A. Campbell 1 R. T. Harriss, 18-7n-10e, Concordia Parish, was drilling below 6,307 ft. Cores from 5,164-74 ft. recovered coarse-grained sand; from 5,894-5,906 ft. the recovery was 6 in. of sand with no shows. On elevation of 60 ft., top of the Wilcox was 3,961 ft.

Danciger Oil & Refining Co. 1 Pittsfield Plantation, irregular Section 42-8n-10e, Concordia Parish, was drilling in shale at 5,470 ft. Electric log tops were: Cocktield 1,441 ft., Cook Mountain 2,043 ft., Sparta 2,220 ft., Cane River 3,122 ft., Wilcox 3,530 ft. Elevation was 71 ft.

In Bossier Parish, R. L. Reese 1 August Cazoux, 34-20n-11w, tested gas and salt water in the Tuscaloosa from 2,665-75 ft., then ran a plastic plug back to 2,665 ft.

Union Producing Co. 1 Section 13 Unit, 13-17n-12w, deep test in Sligo field, Bossier Parish, was drilling in the Cotton Valley shale at 10,717 ft.

Arkla Oil Co. 6 M. L. Pitts, 11-23n-16w, in the Rodessa area of Caddo Parish, set 5½-in. casing at 11,215 ft., ran electrical surveys and prepared to test.

J. S. Henderson 1 R. O. Roy, 35-19n-15w, was drilling below 2,630 ft. A drill-stem test from 1,058-83 ft., with ¼-in. chokes, and open 1 hour, made a fair steady blow and recovered 35 ft. of gas-cut mud, with no oil or salt water. Eighteen feet of Annona chalk was cored from 1,530-50 ft., with no shows. Sample top on the Nacatoch was 1,052 ft.

Plymouth Oil Co. 1 Thigpen-Herold, 12-17n-16w, Caddo Parish, had total depth at 6,503 ft. and was running 5½-in. casing. Electric log tops were: James lime 5,208-5,382 ft., Three-Finger lime 5,551 ft., Travis Peak 5,870 ft., which had a show of gas-distillate on a drill-stem test at 5,905-16 ft. Elevation was 197 ft.

In Claiborne Parish, Ohio Oil Co. and Gulf Refining Co. 1 O. L. Martin, 3-22n-7w, was coring below 10,672 ft. From 10,467-83 ft., in Smackover lime, recovery was 16 ft., being 13 ft. of dense sand with stains and faint gas odor in the top 3 ft., and 1 ft. of white anhydrite. From 10,483-10,533 ft., recovery was 50 ft., being 8 ft. of anhydrite, and 42 ft. of dark gray, very silty lime with calcite crystals and no shows. From 10,533-83 ft., the recovery was 5 ft. of tight sandy and shaly lime, and 45 ft. of shale. From 10,583-10,619 ft. the recovery was shale and sand streaks with no shows. Top on the second Smackover lime was 10,492 ft., by cores, on elevation of 350 ft.

In Union Parish, Zachry Brooks 1 Nelson, 29-23n-3w, had total depth at 9,368 ft. and was fishing out a test tool sleeve. Operators reported a drilling break at 9,315 ft., drilled out to 9,319 ft., then cored from 9,319-68 ft., recovered 3½ ft. of lime with no shows, 2 ft. of medium-porous lime with good oil stain and saturation, 1½ ft. of brown lime, 2½ ft. of brown lime with faint gas odor, and 32½ ft. of lime with no shows.

A drill-stem test from 9,320-68 ft., using ¼-in. chokes and 3,000 ft. of water, recovered 30 ft. of rat hole mud in 15 minutes. Bottom-hole flowing pressure was 1,320 psi. Shut-in pressure was not recorded. When the fish is recovered, it was planned to ream from 9,319-68 ft. and resume coring. Tentative top on the Smackover was 9,315 ft., on elevation of 194 ft.

NORTH LOUISIANA WILDCAT FAILURE

Natchitoches Parish: Continental Oil Co. 1 Edenborn est., 1,020 ft. N, 1,330 ft. E. SW corner SE, 27-12n-6w, dry, TD 7,928 ft., elev. 196 ft., Midway 1,440 ft., Arkadelphia 2,180 ft., Nacatoch 2,214 ft., Saratoga 2,362 ft., Tokio 2,863 ft., Austin 3,580-3,833 ft., Tuscaloosa 3,917 ft., lower Cretaceous 4,236 ft., upper Glen Rose 4,469 ft., Mooringsport 5,473 ft., Massive 6,272-6,518 ft., Rodessa porosity 6,681 ft., James 7,281-7,560 ft., Sligo 7,748 ft.

ARKANSAS WILDCAT FAILURE

Ouachita County: C. E. Miller 1 Hattie Smith, SE SW NW 35-13s-18w, dry, TD 1,435 ft.

N. CENTRAL TEXAS

Clay County Wildcat Recovers Clean Oil

WICHITA FALLS—Continental Oil Co. 2 L. M. Staley, Clay County wildcat, 4 miles northwest of Ringgold, Section 1, H&TCRR Survey, A-253, topped a conglomerate formation at 5,917 ft., drilled 7 ft. of saturated lime, ran a drill-stem test. On the test, from 5,917-24 ft., gas came to the surface in 15 minutes, and after 2½ hours recovery was 3,757 ft. of clean oil, with no water. Location is about 1 mile southwest of a year-old conglomerate discovery drilled in Montague County. Operators planned to set casing for production tests.

Other field reports on drill-stem tests were: From 5,694-5,705 ft., in the Bend conglomerate, a 1-hour recovery was 45 ft. of drilling fluid, plus 1,050 ft. of salt water. Bottom-hole pressure was 2,500 psi. From 5,728-33 ft., open 1 hour, the recovery was 630 ft. of salt water.

Fain & McGaha 2-E C. W. Scaling, Block 98, J. H. Belcher Subdivision, 3½ miles southwest of Deer Creek, Clay County, flowed 120 bbl. of oil in 4 hours, from a sand at 4,447-65 ft. The pay sand was unidentified, and operators were running tubing for further tests.

William Hamm, Jr., 1 Bessie Rhodes, wildcat test about 2 miles north of Throckmorton, and 2 miles south of production, Section 302, BB&C Survey, recovered 3,300 ft. of oil and 30 ft. of heavily oil and gas-cut mud on a 1-hour drill-stem test at 4,356-66 ft. A second test from 4,366-76 ft. recovered 30 ft. of salty mud with no shows. An earlier test, identified as being in the Caddo lime, from 4,336-46 ft., open 1 hour, had gas in 5 minutes and recovered 2,760 ft. of oil. Flowing oil, unestimated, was reported on a test from 4,346-56 ft. It was drilling ahead at 4,530 ft. at last report, and projected to the Mississippian.

In Stephens County, McElroy Ranch Co. 1 Green, Section 1,513, TE&L Survey, recovered oil on two drill-stem tests and was preparing to complete. First test from 4,350-85 ft., open 7 minutes, showed gas in ½ minute, mud in 4½ minutes and oil in 6 minutes. Recovery was 145 ft. of oil plus 60 ft. of oil-cut mud, under flowing pressure of 1,850 psi. Shut-in pressure was 2,075 psi. A second test from 4,387-4,415 ft., open 1 hour, showed gas in 38 minutes and recovered 400 ft. of heavily oil-cut mud and 1,140 ft. of salt water under flowing pressure of 750 psi., and shut-in pressure of 2,000 psi. Operators set 5½-in. casing at 4,450 ft. Total depth was 4,594 ft.

Connally-Thornton and others 1 H. W. Hart, Section 2,065, TE&L Survey, wildcat test 7 miles east of Breckenridge, recovered 150 ft. of gas-cut mud on a 2-hour test from 1,773-1,803 ft.; on 30-minute drill-stem test from 1,953-70 ft. had gas in 13 minutes and recovered 90 ft. of heavily oil and gas-cut mud. A 35-minute test at 3,195-3,247 ft. recovered 26 ft. of mud, with no shows. Total depth was 3,323 ft., and at last report it had been plugged back but the footage was not disclosed. On elevation of 1,118 ft., it had top of the Caddo at 3,305 ft.

New work in Stephens County included Warren Oil Corp. 1 J. M. Fambrough, 330 ft. from east and 700 ft. from north lines of a 60-acre tract, Section 33-6-T&P, 4 miles west-northwest of Frankell. This 4,500-ft. test is on the edge of Frankel field.

Paul and William Moss, of Odessa, were to start this week on the 1 W. M. Cox, wildcat 4 miles east of Breckenridge, which was scheduled to 3,500 ft. with rotary. Location is 330 ft. from west and south lines of the 155-acre Cox tract, Section 2,067, TE&L Survey. It is a twin well to an old Atlantic Refining Co. failure which was said to have made some oil.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Shackelford County: John Bell 1 L. G. Davis, 50-13-T&P, 13 mi. SW Albany, TD 1,562 ft., top pay 1,560 ft., pumped 37 bbl. of 37.9 -gravity oil a day.

Stephens County: McElroy Ranch Co. 1 D. G. Stover "B," 3-8-T&P, 5 mi. NW Breckenridge, TD 4,746 ft., elev. 1,256 ft., top pay 4,600 ft., flowed 175 bbl. of 41°-gravity oil in 12 hr., 11 64-in. choke, GOR 1,075 cu. ft., CP 875 psi., TP 720 psi., Ellenburger (?) pay, no top reported.

Young County: British American Oil Producing Co. 2 G. H. Roach "B," Sec. 304, TE&L Sur., 10 mi. W Olney, TD 4,991 ft., top Caddo pay 4,085 ft., flowed 224 bbl. of 40.7°-gravity oil in 4 hr., 30 64-in. choke, GOR 900 cu. ft., CP 200 psi., TP 375 psi.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: L. T. Burns 1 Frank Brezina, Blk. 4, Meade L. M. Pasture Subd., 2 mi. E Megargel, dry, TD 5,300 ft., Caddo 4,680 ft.

Alvin Clifton 1 R. P. Griffith, Sec. 7, BBB&C Sur., 6 mi. NW Olney, dry, TD 1,300 ft., Gunsight lime 1,224-27 ft.

T. B. Cochran 1 J. T. Richardson, Blk. 8, South Anderson Ranch Subd., 6 mi. SE Megargel, dry, TD 1,292 ft., elev. 1,214 ft., Gunsight lime 1,262-66 ft.

K & G Production Co. 1 Floy Carter, Blk. 6, McKinney & Williams Sur., A-308, 1 mi. SE Dundee, dry, TD 5,292 ft., recovered oil-cut mud on DST of sand 4,492-4,502 ft.

Callahan County: United Development Co. 1 A. B. Foster, Sec. 66, BBB&C Sur., ½ mi. W Clyde, dry, TD 2,308 ft., elev. 2,018 ft., conglomerate 1,780-88 ft. had light oil show, acidized and swabbed water.

Comanche County: E. J. McCurdy, Jr., 1 J. W. Dalton, GS&F Sur. 3, 3½ mi. S Lamkin, dry, TD 3,610 ft., elev. 1,222 ft.

Cooke County: Wilcox Oil Co. and D. H. Bolin 1 G. C. Cartwright, Blk. 3, B. J. Thompson Sur., A-1006, 8 mi. SW Gainesville, dry, TD 1,912 ft.

Haskell County: T. D. Humphrey 1 C. M. Conner, Jane Wilson Sur., A-413, 4 mi. W Weinert, dry, TD 4,805 ft., elev. 1,551 ft., electrical survey did not show Strawn sand.

Jack County: Mid-Continent Petroleum Corp. 1 B. Zuber, J. N. Kirkpatrick Sur., A-1128, 4 mi. SE Post Oak, dry, TD 6,581 ft., Bryson sand 3,806 ft., Caddo 5,364 ft., conglomerate oil show 5,783-93 ft., DST 5,794-99 ft. recovered 60 ft. gas-cut mud, top Ellenburger 6,341 ft.

Montague County: Continental Oil Co. 1 J. T. Garrett, Blk. 100, Panola CSL, 1½ mi. NE Fruitland, dry, TD 7,600 ft., tops not reported, DST in Strawn sand 3,557-71 ft. had salt water, DST in Strawn 4,711-17 ft. recovered 250 ft. of oil and 90 ft. salt water.

Shackelford County: Dillard & Waltermire 1 L. J. Ackers "B," Sec. 16-13-T&P, 12 mi. SE Lueders, dry, TD 1,630 ft.

Taylor County: Kingery-Patterson 1 E. L. Hamilton, Sec. 33-16-T&P, 3 mi. W Abilene, dry, TD 3,200 ft., elev. 1,715 ft., Valera 800 ft., Dotham 1,690 ft., Noodle Creek 1,782 ft., coal 2,070 ft., King sand 2,389-2,410 ft., Cisco reef 2,610 ft., Home Creek 3,160 ft.

West Central Drilling Co. 3 L. N. Brown, Jose Gabo Sur. 128, 7 mi. W Abilene,

dry, TD 3,222 ft., elev. 1,730 ft., no shows.

Young County: Dillard & Waltermire 1 M. K. Graham est., Sec. A, TE&L Sur. 3410, 11 mi. W Graham, dry, TD 4,011 ft. M. R. Stipe 1 W. S. Cole, Sec. 1456, TE&L Sur., 300 ft. N 2 Cole, 6 mi. E Olney, dry, TD 725 ft.

ROCKY MOUNTAIN

Expansion Continues In Western Nebraska

DENVER.—Ohio Oil Co. recovered 100 ft. of 38.8°-gravity oil at its wildcat in the Huntsman area, north of the town of Sidney, Cheyenne County, Nebraska. The well is the 1 Cruise, NW SW SE 7-14n-49w, 5 miles southwest of Gurley pool where the company has Dakota sand production from five wells. First Dakota sand was topped at 4,620 ft., and the zone was silty with no shows to 4,650 ft. On a drill-stem test at 4,650-60 ft. gas was at the surface in 30 minutes, light green oil was recovered in 45 minutes. This oil is higher gravity and lighter green in color than that in the Gurley pool. Ohio is reaming and preparing to drill ahead on the wildcat, which is planned as an 8,000-ft. test to granite. In the same field, Ohio swabbed 119 bbl. of oil in 9 hours on its new pay discovery at the 3 Knievel, SW SW SE 2-15s-49w, an extension one location northwest of production. This well made water on tests in the first Dakota and was deepened as the second well in the field below the first Dakota producing zone. The oil is 34° gravity, the same as produced in other wells. The third Dakota was topped at 4,489 ft. and saturation was found in the upper 15 ft. of sand, with water in the lower zone. The well was drilled to 4,516 ft. and casing cemented through the sand and perforated for completion.

Discovery of oil, reportedly on a seismic high, was made by Steelco Drilling Co. at the 1 McDonald, SW NE SE 32-34n-75w, immediately north of the town of Glenrock, Converse County, Wyoming. The well topped the Muddy sand at 7,202 ft. and flowed 39.8°-gravity green, paraffin-base oil in 14 minutes, with the well shut in at the end of 15 minutes. Gas was recovered at the surface in 5 minutes. Flowing pressures during the test were 2,150 psi. Bottom-hole pressure was 3,200 psi. A total of 24 ft. of saturation was found in the sand and the well was drilled to 7,258 ft., total depth, in shale. Casing has been cemented on bottom and is now being perforated for testing of the zone. This wildcat is located on a tract in the center of a 15,000-acre block held by Phillips Petroleum Co., and discovery of oil immediately outside Glenrock town limits has reportedly led to several deals involving well commitments on town lots. Location is northeast of Big Muddy field, where oil was discovered in the Dakota in 1916. Discovery of oil in this area is expected to lead to further wildcat drilling in the south side of the Powder River Basin, where Continental Oil Co., Union Oil Co. of California, Stanolind Oil & Gas Co., and others have holdings.

Lowell & Voltz, Inc., of Colorado Springs have a failure in their 1 State, SE NW SW 13-4n-93w, on Gossard Dome, Moffat County, Colorado. The well was drilled to 4,549 ft., total depth, with Sundance topped at 4,490 ft. On drill-stem test at 4,527-49 ft., the well made 360 ft. of mud and water in 30 minutes. This wildcat is located on the Axial Basin anticline, northwest of Iles Dome field, where production is from the Morrison and Sundance sands. Continental Oil Co. had one-half interest in the operations.

In the Juniper Anticline area, Oneida County, Idaho, Phillips Petroleum Co. and Utah Southern Oil Co. have announced tentative location for an important wildcat in the SW¼, 10-14s-30e, on a block now being unitized. Phillips will be operator of the unit and plans to drill the well to test zones into pre-Pennsylvanian at around 7,000 ft.

WYOMING WILDCAT FAILURES

Carbon County, Miller Hill: Wasatch Oil Co. 1 Govt.-Unit, NE SE SE 3-17n-89w; TD 2,045 ft., dry; Dinwoody 676 ft., Phosphoria 752 ft., Tensleep 826 ft., Tensleep sand 850 ft., Amsden 1,220 ft., Madison 1,494 ft., Cambrian 1,575 ft.

Crook County, Pine Ridge: Fred Moffatt 1 Barton, C S½ SE 27-50n-65w, TD 470 ft., dry; Dakota 20 ft. Fuson 76 ft., Lakota 146 ft., Morrison 206 ft., Sundance 440 ft.

Uinta County, LeRoy area: Shell Oil Co. 1 Unit, SE NE NE 32-16n-117w, TD 6,201 ft., dry; Twin Creek 884 ft., Nugget 1,408 ft., Ankarah 2,167 ft., Thaynes 3,009 ft., Woodside 3,709 ft., Phosphoria 4,480 ft., Weber 4,693 ft., Amsden 5,422 ft., Madison 5,722 ft.

EASTERN TEXAS

Discovery Offset Prepares to Deepen

DALLAS.—Humble Oil & Refining Co. was reported rigging up rotary to deepen its 1 H. Watts, Francis Holland Survey, 4½ miles northwest of Mineola in Wood County. The heavier rig is expected to explore the Woodbine or Paluxy. Location is a northeast offset to F. R. Jackson and Deupree 1 Joe Carr, sub-Clarksville discovery of last year.

The third well for the new Pine Mills field of southeast Wood County was nearing completion, and fourth test was planned. The prospective producer is Jackson and others 2 J. A. Durrett, David Gille-

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land Survey, which had total depth at 4,929 ft.

In Grayson County, The Texas Co. 1 John Marshall, wildcat 8 miles east of Walnut Bend field, A. Tuttle Survey, A-1193, and 2½ miles south of Sandusky, drilled a sand with oil shows from 7,299-7,302 ft. Cores from 7,302-14 ft. recovered 8½ ft. of light brown sand with oil shows. A drill-stem test was to be made on the section.

B. G. Byars 1 D. B. White, L. A. Matthews Survey, 10 miles south of Sulphur Springs, in Hopkins County, recovered 10 ft. of soft white water sand in coring the Woodbine from 4,486-96 ft. It was drilling ahead at 5,124 ft.

S. M. Aronson 1 Louis Story, Stephens Rogers Survey, 2½ miles northeast of Grapeland, Houston County, was drilling below 4,770 ft.

The Texas Co. 1 Charles Prasifka, A. H. Heatley Survey, 2 miles northeast of Keechi, Leon County, was coring below 5,803 ft. in shale.

Humble's two Nacogdoches County explorations were: 1 Mrs. Ruth Frank, Jefferson Wilson Survey, about 4 miles southeast of Douglass, drilling at 5,570 ft.; 1 Marh R. Saner (hole No. 2), Charles Holmes Survey, A-264, northeast of Trawick, drilling below 7,458 ft.

EAST TEXAS (DISTRICTS 5, 6 AND 6-P) WILDCAT FAILURES

Delta County: Morty Freedman 1 M. L. Pritchard, Henry Dunnetelle Sur., 2½ mi. E Commerce, ¾ mi. E same operator's 1 E. A. Derring, TD 6,220 ft., elev. 474 ft., Pecan 1,676 ft., Austin 2,468 ft., sub-Clarksville 2,952 ft., Woodbine 3,165 ft., Georgetown 3,817 ft.

Denton County: D. H. Bolin and Wilcox Oil Co. 1 P. Cherry, S. Noling Sur., A-969, 3 mi. SW Sanger, dry, TD 2,022 ft.

Wm. H. Rouzer 1 Clara Trietsch, J. Ayers Sur., A-2, 4 mi. S Sanger, dry, TD 2,536 ft.

Navarro County: Republic Natural Gas Co. 1 Viola H. Banner, T. J. Chambers Sur., 3 mi. E Rice, dry, TD 806 ft. in blue shale, elev. 500 ft., tested some oil, and water.

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☐ **Serial No. 56 — "Some Properties of Technically Important Hexavalent Chromium Compounds."**

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CALIFORNIA

New Production Reduces Dominguez Dry Area

LOS ANGELES—The successful completion of Union Oil's 119 Callender in Dominguez field marks a step in the closing of what has been a nonproductive "salient" in the field. This area, about 1,300 ft. deep, has been reduced one-third by this well. Pay interval is in the eighth Callender (Upper Miocene-Puente) at 7,906-8,166 ft. Initial production is 480 bbl. of oil per day with 200,000 cu. ft. of gas. Total depth is 8,606 ft. The company has now set location for the 9 Larronde about 1,400 ft. west of its 119 Callender. Both sites are in Section 32-3s-13w.

Across the intersection of Victoria and Avalon avenues, on the J. Cross property, 32-3s-13w, Standard Oil and Transcal Drilling Co. have spudded two tests, with the eighth Callender zone as objective. Should these wells find oil, the producing area of the deep zone in Dominguez field would be increased by about 70 acres.

General Drilling Co. has plugged its C-9 Fitzhugh USL at 2,500 ft. and will whipstock and redrill the upper Vedder formation. The hole had reached 3,550 ft. The action follows the recent discovery of upper Vedder production in the C-8 Fitzhugh USL. Location is in the McVan area, Section 14-27s-27e.

In the Huasna area, San Luis Obispo County, the H. F. Gibson test, 1 Gibson-Tar Springs Ranch, which discontinued operations last July, filled with heavy oil. The well has been put on pump. Location is 14-32s-14e. Total depth is 810 ft.

Richfield Oil Corp. has added a southeast extension to East Los Angeles field at its 2 U. P. Unit. With perforations in the intervals 9,462-9,172 ft. and 9,130-9,050 ft., the well was swabbed and turned to tanks. Flow is 95 bbl. of 31.3°-gravity oil per day. The well is in Section 16-2s-12w.

Lee Ault & Associates, after finding the 1 Ault dry at 2,409 ft., have spudded in a second test about 400 ft. to the southeast. The new well is the 2 Ault, in Tejon Hills-Comanche Point, 29-12n-18w.

The Carneros Oil Co.'s fault block discovery in Salt Creek field has sparked a try by Standard Oil some 1,000 ft. to the northwest. The first well following the discovery was also a Carneros operation and proved an area about 500 ft. north. Reports indicate that the second well was high structurally. Standard's test will be the 76 Anderson Community in Section 19-29s-21e.

So far E. M. Breen's attempts to extend Placerita production to the west, at his 1 Betsy Linda, have proved discouraging. The first test reached 2,830 ft., and at the interval 715-25 ft. recovered only water. The operator plans further tests.

CALIFORNIA WILDCAT FAILURES

Kern County, Gosford area: Hancock Oil Co. 22-23 KCL, 23-30s-26e, dry, recovered salt water and small amount of oil, TD 8,300 ft., elev. 355 ft.

Mount Poso area: Ring Oil Co. 1 Glide 29, 29-27s-28e, dry, Vedder 2,272 ft., TD 2,350 ft., elev. 980 ft.

Tejon Hills area: Lee Ault & Assoc. 1 Ault, 29-12n-18w, dry, TD 2,409 ft., elev. 760 ft.

S. & M. Oil Co. 2 S. & M., 2-11n-18w, dry, bottomed in granite, TD 544 ft., elev. 1,362 ft.

S. & M. Oil Co. 3 S. & M., 2-11n-18w, dry, bottomed in granite, TD 300 ft., elev. 1,307 ft.

Los Angeles County, Del Valle area: St. Helens Petroleum Co. 1 Ladd, 7-4n-17w dry, TD 4,501 ft., elev. 1,452 ft.

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Ventura County, Cuyama Valley area: Richfield Oil Corp. 1 Quatal unit, 34-9n-24w, dry, TD 4,010 ft., elev. 3,205 ft.

MICHIGAN

Two Western Area Tests Have Favorable Shows

MOUNT PLEASANT. — Two west-state wildcats, both drilled by Mercer Oil Co., Inc., and both following a core-drill program by Carter Oil Co. in the respective areas, were showing commercial or near-commercial Traverse oil pays this week. One test was in Cedar Creek Township, Muskegon County, and the other was in Benona Township, Oceana County.

On the basis of early tests, the Cedar Creek venture appeared to be the most promising of the two tests. Mercer's 1 Knitter, SW SW SE 23-11n-15w, Muskegon County, logged Traverse oil pay at 1,951-53 ft.; showed 300 ft. of free oil natural in 24 hours, and was rated good for 10 bbl. a day natural. On initial pump-flow tests after acid treatment with 100 gal., the well produced 55 bbl. of oil and appeared to be pumped off. The following morning a show of water was reported, but analysis of this appeared to conclusively prove that it was coming from up the hole due to a faulty 5-in. casing packer. Rods, tubing, and casing were being pulled to allow resetting of a long string of casing for further test. Traverse lime top was logged at 1,943 ft. The wildcat followed a seven-well core-drill program by Carter in the area and bulk of acreage in the play is controlled by Mercer and Carter.

Other encouraging wildcat was Mercer's Brazee 1, NW SW NW 13-14n-18w, Oceana County, located 9 miles northeast of Carter's fabulous (for Michigan) Stony Lake Traverse pool. This test showed from 2-3 bailers of free oil natural overnight from the Traverse at 1,670-73 ft. An effort to acidize with 500 gal. was made, but after 200 gallons had been "pressured" into the formation casing packer failed. However, the well swabbed about 10 bbl. of net oil following this treatment. Deepening operations were ordered to the "Stony Lake" zone and if this proved void of oil, then on to the Dundee-Monroe horizons. Operators plan to plug-back, cement casing, and retest the upper Traverse if the lower beds are dry. Traverse lime was logged at 1,670 ft.

MICHIGAN SUCCESSFUL WILDCAT

Newaygo County, Denver Township: Admiral Oil 1 Dastick et al, SE NE NE 9-14n-14w, Berea 1,512 ft., Traverse 2,121 ft., dry in Traverse, TD 2,142 ft., PB 1,533 ft., 3 bbl. from Berea after 500 gal. acid.

MICHIGAN WILDCAT FAILURES

Allegan County, Lee Township: Ford Oil Co. 1 Dubas, SE NE NE 7-1n-15w, Traverse 1,136 ft., dry, TD 1,86 ft.

Antrim County, Mancelona Township: Mercer Oil Co., Inc., 1 State, SW SW SE 32-29n-6w, Traverse 1,680 ft., dry, TD 1,715 ft.

Lake County, Elk Township: W. B. Darke 1 Felton, NE NW SW 12-20n-14w, Monroe 2,639 ft., dry, TD 2,702 ft.

Mason County, Riverton Township: Mercer Oil Co., Inc., 1 Lessnick, NW NW SE 33-17n-17w, Monroe 2,276 ft., dry, TD 2,280 ft.

Osceola County, Orient Township: Sohio Petroleum Co. A-1 Buxton, SE NW SE 11-17n-7w, Dundee 3,879 ft., dry, TD 3,975 ft.

Van Buren County, South Haven Township: Ford Henry 1 Lang, SW NW NE 22-1s-17w, Traverse 1,050 ft., dry, TD 1,058 ft.

MISSISSIPPI

Florida May Get Important New Strike

JACKSON. — In Dade County, Florida, Coastal Petroleum Co. 1 State-Grossman, 25-55s-37e, is the first promising oil discovery for Florida in many months. A core at 10,775-78 ft. recovered $1\frac{1}{2}$ ft. of dolomite with slight show of oil. A second core was cut at 10,778-81 ft. with recovery being $1\frac{1}{2}$ ft. of porous dolomite with slight show of oil. A drill-stem test was run from 10,775-81 ft. with $\frac{5}{8}$-in. top and bottom chokes. The tool was open 24 hours and recovery was 20 ft. of oil and gas-cut mud, 80 ft. muddy salt water, and 2,100 ft. of salt water. The well was cored solid after drill-stem test from 10,781-10,830 ft. with no shows being encountered. At latest report, well was coring below 10,830 ft.

In Mississippi Danciger Oil & Refining Co. is testing its 2 George W. Armstrong, 5-4n-2w, Wilkinson County wildcat. The initial test at 5,083-89 ft. recovered approximately 3,700 ft. of salt water with a trace of oil. Operators squeezed perforations in an effort to shut off salt water and expect to reperforate the same level. The well was drilled to a total depth of 8,307 ft. and after oil shows were found in sidewall cores cut in the top of the Wilcox, 7-in. casing was set to 5,170 ft. The test is located approximately 3 miles south of Armstrong field, Adams County. If completed as a commercial producer, it would be the first field to be found in Wilkinson County.

Humble Oil & Refining Co.'s two "tight" Adams County wildcats continue to be the subject of much speculation. The D-1 McKittrick, 50-7n-3w, is reported to be drilling below 9,000 ft. It is reported to have logged an 8-ft. oil sand section in the Wilcox, but

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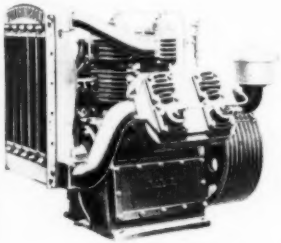

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HOUSTON NEW ORLEANS DALLAS

no verification has come from the operators. The company's 1 Roane F. Byrnes, 13-5n-3w, northwest of Armstrong field, is drilling below 10,200 ft.

MISSISSIPPI WILDCAT FAILURES

Issaquena County: S. C. Oil Grop 1 Joe Lazarov et al, 9-11n-8w, dry, TD 8,171 ft.

Jasper County: Red Wing Drilling Co. 1 E. S. Lee, 18-2n-12e, dry, TD 5,526 ft.

OKLAHOMA

Mazda Producer Extends Ringwood Pool Southeast

MAZDA OIL CORP.'s 1 Black, NE NW NW 12-21n-10w, $1\frac{1}{2}$ miles southeast of production in the Ringwood pool, eastern Major County, flowed at the rate of 10 bbl. of oil per hour and an estimated 3,000,000 cu. ft. of gas per day to prove another major extension of the pool's rapidly spreading productive area. Bottom of the hole is 6,950 ft., where casing was run, and then perforated at 6,800-6,886 ft. in the Manning sand, the pool's producing horizon. Depth of the pay is approximately the same as in the pool.

Alpha Petroleum Corp. 1 Hargrove, NE SE NE 1-16n-1w, new pool opener, $2\frac{1}{2}$ miles south of Langston, Logan County, is reported to have flowed up to 10 bbl. of oil per hour through 7 16-in. choke while testing Misener sand with hole open at 5,072-90 ft. Gravity of the oil is approximately 41°. Nearest production is in the Northwest Iconium pool, 2 miles to the east. Location has been made for 2 Hargrove, a location north in the SE NE NE of the section.

Another new producing spot a mile from other production in an isolated part of the North St. Louis district, 4 miles west of Maud, in Pottawatomie County, is being opened by R. H. Vise in his 1 Terry Owens, SE SW NE 24-8n-4e. Bottom of the hole is in the second Wilcox sand, logged at 4,510-15 ft., with 7-in. casing cemented at 4,433 ft., 2 ft. in the first Wilcox. With casing perforated in the Simpson dolomite, topped at 4,352 ft., the well swabbed at the rate of 4 bbl. per hour following a 1,000-gal. acid treatment. Plug then was set between that interval and the Viola lime, in which casing then was perforated at 4,252-69 ft., and from which pay the well swabbed $7\frac{1}{2}$ bbl. of oil per hour after acidizing. The well also has 8 ft. of saturation in the top of the first Wilcox, which will be tested later.

OKLAHOMA SUCCESSFUL WILDCAT

Osage County: Oliphant 1 Osage, SE SE SW 22-25n-3e, pumped 75 bbl. of oil per day from Layton at 2,669-82 ft., TD 3,789 ft.

OKLAHOMA WILDCAT FAILURES

Carter County: Trumter 1 Carlock - Von Weise, NE NE SW 22-4s-3w, dry, TD 2,535 ft.

Comanche County: Best et al 1 Conner, SE SE NW 23-1n-11w, dry, TD 310 ft.

Pritchard 1 Grant, NW NW SE 21-2n-11w, dry, TD 400 ft.

Cotton County: Nagle 1-A Emery, SW SW NW 26-4s-13w, dry, TD 2,632 ft., fusilinid lime 1,853 ft., Megargel 2,002 ft., sand 2,270 ft.

Ross 1 Puoollaw, SE SW NW 28-5s-12w, dry, TD 1,935 ft., broken sand 1,012 ft. and 1,074 ft., both water, sand 1,336 ft. and 1,550 ft., both water, fusilinid lime 1,573 ft., Megargel lime 1,708 ft., sand 1,897 ft.

Kiowa County: K & D Oil Co. 2 Watkins, NE NE NW 29-7n-17w, dry, TD 1,400 ft.

Seminole County: Porter Oil & Gas 1 Harris Foundation, NE NE NE 8-10n-7e, dry, TD 3,911 ft., oolitic lime 1,250 ft., Checkerboard 1,650 ft., lime 2,114 ft., coal 2,835 ft., Senora lime 2,905 ft., Senora sand 2,932 ft., Earlsboro 3,197 ft., Inola 3,385 ft., Bartlesville 3,390 ft., lime 3,545 ft., Booch 3,725 ft., Gilcrease

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APPALACHIAN FIELD

Two Deep Tests Scheduled Near W. Va. Gas Producer

PITTSBURGH—Two locations for Oriskany sand wells have been made in West Virginia, in the vicinity of the large Barnette gas well. The two new deep tests are: Godfrey L. Cabot, Inc., 1-1317 Thomas Hughes, elevation 1,051 ft., in Tucker district, Wirt County, on the Belleville Quadrangle 2.15 miles south of Latitude 39 degrees .05 minutes, 2.30 miles west of Longitude 81 degrees, 30 minutes; Columbian Carbon Co. 1-1139 Augusta Carson Radcliff et al, elevation 846 ft., in Steele district, Wood County, on Belleville Quadrangle 2.22 miles south of Latitude 39 degrees .05 minutes, 3.37 miles west of Longitude 81 degrees 30 minutes.

In Portland district, Preston County, Snee & Eberly 2 Cora E. Lewis, elevation 1,953 ft., is drilling at 5,026 ft., with the Tully lime recorded at 4,563-78 ft. In Poca district, Kanawha County, United Fuel Gas Co. completed a good shallow sand well, its 5-7026 J. J. Beane et al, gaging 5,512,000 cu. ft. of gas in the Big lime. Total depth is 1,750 ft.

New locations reported in West Virginia totaled 13, scattered in Grant district, Monongalia County; Marsh Fork district, Raleigh County; Murphy district, Ritchie County; Ellsworth district, Tyler County; Buckhannon district, Upshur County; Union district, Wayne County; Tucker district, Wirt County; Steele and Walker districts, Wood County; Baileysville and Oceana districts, Wyoming County.

Southwest Pennsylvania operations include: Derry Township, Westmoreland County, Peoples Natural Gas Co. 4-3814 Camilla Giffen, elevation 2,238 ft., drilling at 9,035 ft.; Napier Township, Bedford County, South Penn et al, Snee & Eberly 1 Jesse B. Miller, elevation 1,666 ft., drilling at 5,431 ft.; Wharton Township, Fayette County, William E. Snee et al 3 Indian Creek Coal & Coke Co., elevation 2,615 ft., drilling at 6,923 ft.; Georges Township, Fayette County, Orville Eberly et al 1 N. E. Murphy, elevation 2,560 ft., drilling at 6,329 ft.

Nine new sites in southwest Pennsylvania were located in Boggs, Mahoning, and Plumcreek townships, Armstrong County; Red Bank Township, Clarion County; Beaver Township, Jefferson County; Amwell and West Bethlehem townships, Washington County; Allegheny Township, Westmoreland County.

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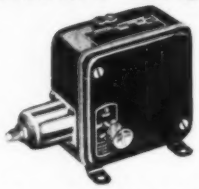

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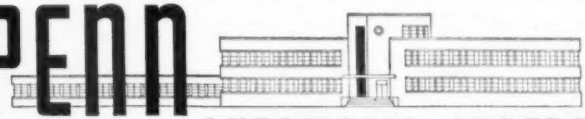

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SOUTHWEST TEXAS

Six Successful Wildcats Pace Week's Operations

CORPUS CHRISTI.—Jergins Oil Co. of Texas is completing the 1 Albert Martin, Trustee, for a new oil discovery 5 miles northwest of Hebbronville, Duval County. On drill-stem test run at 3,057-68 ft., the well flowed oil in 1 hour and 40 minutes through ¼-in. choke with 25 psi. working pressure. The well is now being washed in.

One and one-half miles southwest of Alice, W. B. Osborn has completed the 1 H. M. Chiles for a shut-in gas discovery in Jim Wells County. The hole was drilled to a depth of 5,345 ft. and completion was made through perforations at 4,978-96 ft. No details are available.

No gage has been made yet on the Taylor Refining Co. and Mayfair Minerals, Inc., 1 Klump, deep oil discovery south of Pharr, Hidalgo County. Total depth is 10,407 ft. and 5½-in. liner is set 1 ft. off bottom. The same operators 1 Roy Barnes, 1,729 ft. due west of the discovery, is drilling below 2,500 ft. It is contracted to 12,500 ft.

Ryan, Hays & Burke 1 Margaret E. Davis, new Aransas County discovery north of Gregory, has been completed for 2,800,000 cu. ft. of gas daily plus 200 bbl. of distillate through ¼-in. choke. Total depth is 9,263 ft. with casing set at bottom, and production is through perforations at 9,251-54 ft.

O. W. Killam 1 De Los Santos, Webb County discovery in Survey 729, 1 mile south of Lopez field, pumped 100 bbl. of oil plus 20 bbl. of water on potential. The well is producing from the Pettus at 2,559-64 ft.

Baldridge & King, Inc., 1 T. B. Slick Estate, Starr County wildcat in "El Panal" Grant, has been completed for a gas well and is waiting on potential gage. Completion was made through perforations at 7,080-7,104 ft.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Duval County: The Texas Co. 1 Duval Co. Ranch Co., GC&SF RR Co. Sur. 253, 7½ mi. SW Freer, dry, TD 2,998 ft.

Jim Hogg County: Daubert & Achning et al 1 Merchants State Bank, Sur. 151, 22 mi. SW Hebbronville, dry, TD 1,260 ft.

McMullen County: Rowan & Hope and M. L. Massingill 1 Tom Franklin, J. A. Hernandez Sur. 962, 2 mi. W-SW San Miguel area, 2 mi. NW Green Franklin field, dry, TD 6,010 ft.

Milam County: Byrd Oil Co. 2 Lucinda Green, W. D. Thompson Grant, 3 mi. W Gause, dry, TD 5,930 ft.

Webb County: Dulaney Oil Co. 3 A. M. Bruni Est., Sur. 2083, 9 mi. SW Mirando City, dry, TD 1,590 ft.

F. P. Schwab et al 1 Zaragosa Laurel Est., BS&F Sur. 717, 4½ mi. SE Oilton, dry, TD 3,312 ft.

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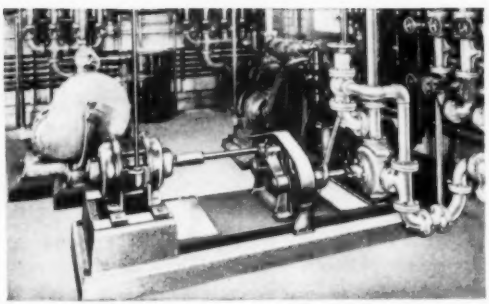

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TEXAS GULF COAST

Dually-Completed Wildcat Rates Good Initial Flow

HOUSTON—Final completion has been made on McCarthy & Gas Corp. 1-A Schiller, dual sand wildcat discovery in the New Ulm area of Austin County. The well flowed 450 bbl. of 39°-gravity oil daily through a 12 64-in. choke from perforations at 9,467-85 ft. Tubing pressure was 1,500 psi. and gas-oil ratio was 1,250. In the upper sand at 9,048-58 ft., the well flowed 300 bbl. of 41.1°-gravity oil daily through a 16 64-in. choke. Casing pressure was 500 psi. and gas-oil ratio was 1,176.

The Texas Co. has discovered a new sand in the West Columbia area of Brazoria County, with completion of the 37 J. G. Phillips et al. Most of the production in this area is from the 5,600-5,700-ft. level. The new well is producing 181 bbl. of 29.7°-gravity oil daily through perforations at 6,180-6,210 ft., with the hole bottomed at 6,531 ft. The well is located in the George Tennille League.

Stanolind Oil & Gas Co. has run a potential test on the 1 J. Bluhm, gas discovery 12 miles northwest of Goliad in Goliad County. The well flowed 6,800,000 cu. ft. of gas per day on open flow. Through a 17 64-in. choke, it flowed at the rate of 67 bbl. of 51°-gravity condensate, 111 bbl. of salt water, and 2,884,000 cu. ft. of gas per day. Tubing pressure was 2,170 psi. and casing pressure was 2,460 psi. The hole was drilled to a depth of 9,015 ft. and was plugged back to 8,121 ft. for completion. Production is through perforations at 8,042-50 ft.

Stanolind is nearing bottom in its A-2 State Lease 31,685, offshore from Galveston County. Operators are drilling below 7,310 ft. and hole is projected to 7,600 ft.

Housh Drilling Co. was unsuccessful at its 1 Mrs. Jennie Clearwater, potential Wilcox discovery in the J. McDillon Survey, Montgomery County. Wilcox was topped at 7,835 ft. and the well swabbed oil, gas and water. Several attempts to complete the well failed when it flowed salt water.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Brazoria County: New pay at West Columbia—The Texas Co. 37 J. G. Phillips et al, Geo. Tennille League, top sand 6,180 ft., TD 6,531 ft., perf. 6,180-6,210 ft., 181 bbl. of oil per day, 9 64-in. choke, GOR 265, TP 620-700 psi., 29.7 gravity.

Colorado County: Gas-condensate discovery—The Chicago Corp. 1 John Drlik, San Kennelly Sur., top sand 6,796 ft., perf. 6,796-6,800 ft., TD 10,080 ft., 2,500,000 cu. ft. of gas daily plus 75 bbl. condensate, 5 16-in. choke, 56.1° gravity, GOR 35,013, TP 1,975 psi.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Brazoria County: J. S. Abercrombie Co. and Magnolia Petroleum Co. D-1 MacDonald, Old Ocean field, John Cummings Sur., 3½ mi. E Sweeny, dry, TD 11,600 ft.

Harold Link et al 1 Belle Wisdom, A Darst League, A-61, 2½ mi. NE Damon, dry, TD 8,521 ft.

Fort Bend County: Jack Aronson & W. J. Mihovall 1 Mrs. Wilma B. Beard, H&TC Sur. 118, A-583, 4½ mi. NE Damon townsite, dry, TD 1,760 ft.

Gonzales County: Producers Corp. of Nevada 1 J. T. Anderson, P. S. Barnett Sur., A-122, dry, TD 6,218 ft.

Harris County: Andrews et al 1 Frank K. Meyer, H. Aiken Sur., A-98, 2 mi. SW Bellaire, dry, TD 5,104 ft.

Montgomery County: C. N. Housh 1 Mrs. Jennie Clearwater, Wm. S. Allen Sur., A-2, 2 mi. NW Conroe, dry, TD 8,516 ft.

Sinclair Oil & Gas Co. 1 H. N. Grogan, Archibald Hodge Sur., A-18, 8 mi. SW Conroe, dry, TD 9,794 ft.

PERMIAN BASIN

Interest Centered in Mitchell and Borden Tests

MIDLAND.—Mitchell and Borden counties were holding attention this week as one Ellenburger extension was completed, and new Canyon reef limestone production was in prospect.

In Mitchell County, 3 miles southwest of the town of Westbrook, Superior Oil Co. completed its 2 Jim Plaster, NW SE 4-98-T1S-T&P, flowing 338 bbl. of 44.9 -gravity oil a day through 14/64-in. choke, with no water. Production was from open hole in the Ellenburger at 7,987-92 ft., total depth. Top of the pay was reported at 7,987 ft., on elevation of 2,196 ft., and 7-in. casing was set at that depth. Tubing pressure was 700 psi., and gas-oil ratio was around 100 cu. ft. An earlier report credited the well with flowing 180 bbl. of oil in 9 hours, having kicked off to flow when an acid treatment was attempted.

Location of the 2 Plaster is 2 miles north and about 1 mile east of Superior's 1 Dockery, Section 17, which completed for 172 bbl. of oil and 60 bbl. of water a day from the Ellenburger at 7,984-8,004 ft.

In Borden County, Amerada Petroleum Corp. 1 N. C. Von Roeder, approximately SE SW 103-25-H&TC, some 4 miles west of Sharon Ridge Canyon field, had better prospects for production following the second drill-stem test.

On a 4-hour drill-stem test from 6,822-50 ft. gas showed at the surface in 2 minutes, estimated at 30,000 cu. ft. daily, but decreased rapidly after the first hour. Recovery was 120 ft. of gas-cut mud and 180 ft. of oil and gas-cut mud which was said to be 40 per cent oil.

A second 4-hour test from 6,834-75 ft., through 5/8 and 1-in. chokes, showed gas in 5 minutes at the rate of 124,000 cu. ft. daily, which decreased to 6,000 cu. ft., and recovered 91 ft. of gas-cut drilling mud, 90 ft. of heavily oil and gas-cut mud, 243 ft. of extra heavy oil and gas-cut mud, plus 30 ft. of free oil. Total depth was 6,910 ft., and operators were preparing to run another test.

According to field reports, the 1 Van Roeder topped the reef at 6,835 ft., or minus 4,467 ft., which was about 100 ft. low to the nearest reef producers in Sharon Ridge field. Top of the reef checked some 223 ft. higher than the 1 Canning, Ellenburger failure northeast, in NE SE of the same section. Following reports on the second drill-stem test, lease prices between the well and the field were said to have increased rapidly.

Scurry County.—Standard-Fryer Drilling Co. 1 J. B. York, NW NW 180-3-H&GN, southeast extender to the Wilkerson sector of North Snyder field, was testing on various chokes from open hole below casing at 6,728 ft. and 6,764 ft., total depth. On one 12-hour test it flowed 276 bbl. of oil through 22/64-in. choke, on tubing pressure of 600 psi., casing pressure of 460 psi., and gas-oil ratio of 700 cu. ft. Top of the reef was minus 4,384 ft.

R. W. Baxter 1 Feldman, Ellenburger well in 63-3-H&TC, was reported pumping at the rate of 3½ bbl. of oil an hour, plus 2 per cent sediment and drilling water.

In the northwest section of Sharon Ridge shallow field, D & R Oil Co. 17 W. F. Burney, formerly reported as 1 Burney, and originally drilled by Cities Service Oil Co. and plugged, has been called a discovery well in the Clear Fork. Total depth was 8,238 ft., plugged back for completion at 3,004-3,110 ft. After shooting with nitro the well completed on the pump for 60.7 bbl. of 30 -gravity oil, plus 6 bbl. of salt water and sediment. With elevation of 2,289 ft., it logged the following tops: San Andres 1,500 ft., Glorietta 2,290 ft., reef 6,882 ft., Strawn 7,380 ft., Mississippi lime 7,980 ft., Ellenburger at 8,125 ft.

Youngblood & Foree 1 E. S. Wilkirson, SE SE Lot 19, Section 40, Kirkland & Fields Survey, semiwildcat located 1,320 ft. west of Standard-Fryer 1 Wilkirson, completed for a flowing potential of 1,302 bbl. of 43 -gravity oil a day, from open hole. Top of the reef at 6,594 ft., minus 4,503 ft., was said to be about 23 ft. high to the Wilkirson. Total depth was 6,675 ft., with top of pay at 6,599 ft. Flowing pressures were 750 psi. on tubing and 900 psi. on casing. Gas-oil ratio was 831 cu. ft.

T. W. Doswell 4 C. W. Addison, west edge well in Sharon Ridge Canyon f.e.d. NE SW 122-25-H&TC, completed for a flowing potential of 2,040 bbl. of 43 -gravity oil a day, through 32/64-in. choke, from open hole below casing at 6,680 ft., and total depth of 6,711 ft. Flowing pressures were 700 psi. on tubing and 400 psi. on casing, with gas-oil ratio at 925 cu. ft. Reef top was 6,680 ft.

One mile east of production on the south end of Kelly field, George P. Livermore, Inc., 1 H. Winston, Tract 63, Section 11, Block 1, J. P. Smith Survey, recovered 480 ft. of salty water-cut mud with a rainbow show of oil on the bottom, on a 1-hour drill-stem test at 7,267-7,302 ft.

One mile north of the same field, Nelson Bunker Hunt 1 W. J. Coonrod, 467 ft. from north and east lines, of the southwest 83 acres in 251-97-H&TC, completed for 496 bbl. of 44 -gravity oil a day through ¼-in. choke, on the basis of a 7-hour test. Gas-oil ratio was 994 cu. ft.; tubing pressure was 250 psi. and casing pressure 725 psi. Production was from open hole below casing at 6,532 ft., and total depth 6,655 ft. On elevation of 2,400 ft., it had top of the reef at 6,541 ft., minus 4,131 ft.

Winkler County.—Gulf Oil Corp. 146-D Keystone, SW SE 24-A-57-PSL, completed as a ½-mile northeast extension to Flying W field, flowing 209.56 bbl. of 37.5 -gravity

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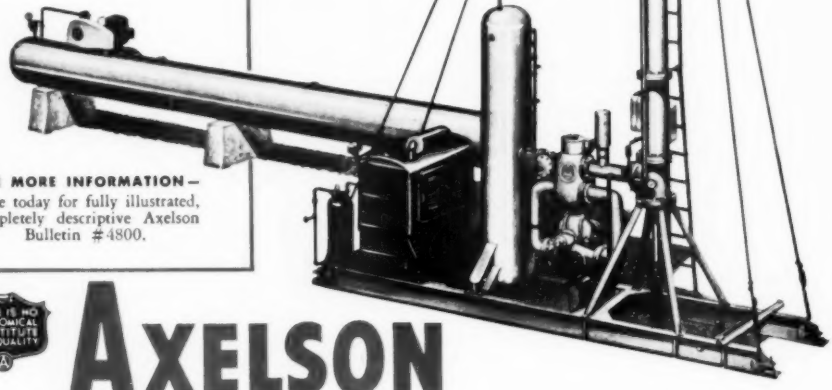

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oil a day, plus 4 bbl. of water, through ½-in. choke. Gas-oil ratio was 856 cu. ft., and pressures were 600-320 psi. on tubing and 280-120 psi. on casing. It was drilled to 11,877 ft., then plugged back to 9,800 ft. Top of Devonian pay was 9,607 ft. Formation tops, on elevation of 3,141 ft., were: Devonian 9,608 ft. (31 ft. high to the discovery well), Fusselman 10,270 ft., Montoya 10,525 ft., Ellenburger 11,795 ft.

Coke County.—Humble Oil & Refining Co. completed its 3 Sallie Odom, Seforiano de la Garza Survey 304, semiwildcat test 4 miles southeast of Blackwell. Total depth was 5,541 ft., elevation 1,989 ft., top of Strawn 5,050 ft., Pennsylvanian pay from 5,520-30 ft., plugged back total depth. On completion test it pumped 37 bbl. of 44°-gravity oil, plus 62 bbl. of water. Location is 4,500 ft. west of the 2 Odom, which was dry, and 3,700 ft. north of Barnsdall's 1 Davenport, a small pumper.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Crane County: Moore Exploration Co. 1 T. C. Barnsley, N. A. Williams Sur. 10, 12 mi. W Crane, 2 mi. SE Sand Hills shallow production, dry, TD 6,559 ft., elev. 2,473 ft., Devonian 5,903 ft.

Garza County: Sam G. Dunn 1 Hammond-Amerada, Sec. 1235, AB&M Sur., 2 mi. NW Garza field, dry, TD 3,530 ft., elev. 2,896 ft.

Pecos County: E. L. Heard and Ray L. Pepper 1 Kansas City & Ft. Stockton Land & Oil Co., 31-178-TCRR, 1½ mi. S Yates field, 7 mi. SW Iraan, dry, TD 2,370 ft., elev. 2,914 ft., Yates 2,160 ft.

Scurry County: Placid Oil Co. 1 Cornelius Davis, NW NE 387-97-H&TC, 6½ mi. NE Snyder, dry, TD 7,905 ft., elev. 2,335 ft., Canyon 7,018 ft., Strawn 7,310 ft., Mississippian 7,508 ft., Ellenburger 7,780 ft., logged water at 7,150 ft. and pay section at 7,018-50 ft.

Stanolind Oil & Gas Co. 1 J. G. Whatley "A," SE SW 548-97-H&TC, 2½ mi. NE of production, dry, TD 8,340 ft., PB 7,770 ft., elev. 2,572 ft., Wolfcamp 5,628 ft., Canyon 7,265 ft., Strawn 7,430 ft., Mississippian 7,970 ft. (tentative), Ellenburger 8,210 ft.

Tom Green County: J. B. White and V. A. Hughes 1 Jeff Scherz, Sec. 1, Wm. Scherz Triangular Sur., 7 mi. W Susan Peak field, dry, TD 6,524 ft., elev. 2,056 ft., Strawn 5,396 ft., Ellenburger 6,270 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Continental Oil Co. 1-B-3 Hawk, 3-21s-37e, west offset to Southern Union Oil Co. 1 State, discovery of North Drinkard field, completed this week for a flowing potential of 626 bbl. of 39°-gravity oil a day, plus 374,000 cu. ft. of gas, through 1-in. opening on tubing. Tubing pressure was around 50 psi. On elevation of 3,481 ft., it had top of the Drinkard pay at 6,642 ft., and drilled to 6,782 ft., total depth. Perforations were made at intervals from 6,642-6,768 ft. ft.

Texas Pacific Coal & Oil Co. completed its 1-B State, Account 1, 2-12s-33e, northeast outpost to Bagley Devonian field, flowing approximately 100 bbl. of oil an hour for an unspecified time. The well was drilled to 10,914 ft. On elevation of 4,243 ft., it had top of the Pennsylvanian at 8,660 ft., Mississippian at 10,440 ft., and the Devonian at 10,770 ft. Top of pay was around 10,870 ft.

Atlantic Refining Co. 1-A Dickenson, NW NW 13-15s-37e, ran a 2-hour drill-stem test from 11,222-318 ft., in an unidentified but apparently Devonian section, which recovered 500 ft. of slightly oil-cut and heavily gas-cut water blanket, and 1,520 ft. of oil, gas and water blanket-cut mud. It drilled ahead below 11,840 ft.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Lea County: T. W. Bailes and E. C. Von Glahn 1 Dailes, SW SE 5-6n-1e, dry, TD 6,096 ft., elev. 5,301 ft., show of oil 3,350-60 ft., hole caved in at 5,375 ft.

CANADIAN FIELDS

O'Meara Barrhead Test Has Madison Oil Show

CALGARY.—The O'Meara Canadian Drill-Co. had an encouraging oil show in the Madison limestone at its Barrhead venture, but also obtained salt water. The well is located in LSD 2, 15-58-5w5, on a farmout from Stanolind Oil & Gas Co. and Imperial Oil, Ltd.

The Madison was topped around 3,970 ft. and a 1-hour drill-stem test was run of the interval 3,972-81 ft. There was an estimated recovery of 1,200 ft. of oil in the drill pipe, but since the valve did not hold, drilling mud forced the oil out of the pipe and final recovery was heavily oil-cut mud. Coring was carried to 3,988 ft., and a further test was run. The second test, of interval 3,973-88 ft., gave a flow of natural gas to the surface 8 minutes after tester was opened. Gas volume was estimated at 60,000-90,000 cu. ft. daily. When drill pipe was pulled fluid recovery amounted to 1,950 ft., consisting of 300 ft. of oil and 1,650 ft. of salt water, in 1 hour.

The hole has been carried down to 4,020 ft., and 5½-in. casing set at bottom. Crew will perforate opposite the Madison limestone, squeeze cement in efforts to shut off the formation water, and then run a series of tests to determine whether it is possible to make the well into a commercial producer. Gravity of the oil is believed to be comparable to that found at the Stanolind-Imperial Barrhead discovery well, which averaged about 22°-23°.

A United States group, headed by Herbert J. Waugh of Spokane, has commenced

drilling at a wildcat in north central Alberta, about 65 miles north of Edmonton. The new test, Canadian-American 1, LSD 9, 7-64-23w4, is drilling below 1,600 ft. The well, located about 5 miles northwest of the town of Perryville, will be a test of Cretaceous and Devonian possibilities down to and including the D3 zone. Nearest previous operation was the Decalta-Perryvale 1, wildcat about 4 miles southwest of the new venture.

The past week brought the completion of 20 wells in Alberta, 17 oil wells, and 3 dry holes, 2 unsuccessful step-out ventures, and 1 rank wildcat failure.

At Stettler, British Empire Oil Developments, Ltd., Calgary-based independent, placed its D2 Devonian oil discovery well on production with a potential of 700 bbl. daily.

At Redwater, 13 wells were successfully completed, and one step-out venture failed to find production. Imperial Oil, Ltd., again headed the list for completions this week, with potentials ranging from 168-1,392 bbl. daily. The Texaco Exploration Co.-McColl Frontenac Oil Co. team obtained three more producers this week. Canadian Gulf Oil Co., and the Calvan-Atlantic-Princess-Pacific group each placed one more oil well on production. The team of Central Redwater Syndicate and Pacific Petroleums & Associates failed to find production at its first Redwater venture after it contacted the D3 zone of Devonian but found it too tight to yield oil.

Three new wells obtained their initial production in the Leduc-Woodbend fields. At Leduc, Pan-Western Oils, Ltd., placed its first well on production. Rig has been moved ¼ mile north of the initial success, to commence drilling operations at a second well on the company's quarter section farmout from Imperial Oil, Ltd. Calmar Oils, Ltd., placed its third successful D2 zone completion on flow in the southwest sector of Leduc field. At Woodbend, the Home Oil Co.-Anglo Canadian Oil Co.-Calgary & Edmonton Corp. team successfully completed its eleventh D3 zone oil well.

In addition to the Redwater duster, two other wells failed to find oil or gas; a stepout drilled by the Whitemud Syndicate in the Whitemud area was unsuccessful; also Royalite Oil Co.'s exploratory test at Consort was classed as a failure.

The Sohio Petroleum Co. group has commenced drilling at its fourth stratigraphic test in Saskatchewan. The group, with around 9,000,000 acres of Crown permit under commitment and about 2,000,000 acres of freehold, is moving in special equipment and plans to operate five gravity meter crews throughout the winter months. Other participants in Sohio's Saskatchewan program include: Texas Gulf Producing Co. of Houston, Tex.; The Union Sulphur Co., Inc., of Lake Charles, La.; The Chicago Corp. of Corpus Christi, Tex.; Republic Natural Gas Co. of Dallas, Tex.; Midstates Oil Corp. of Tulsa, Okla.; and The Bradley Producing Corp. of Wellsville, N. Y.

Royalite Oil Co. has started drilling at its wildcat on Graham Island, off the west coast of British Columbia. The well, Queen Charlotte 1, was spudded in November 30.

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SOUTH LOUISIANA

Prospective Gas Sand Being Tested Offshore

NEW ORLEANS.—A good gas sand has been reported in Magnolia Petroleum Co. B-1 State Lease 673, Terrebonne Parish wildcat approximately 5 miles offshore in the Eugene Island area. Operators indicated that the gas sand was found on test of perforations at 11,206-08 ft. Perforations were squeezed and operators are now preparing to test a new zone at 10,278-82 ft. If this formation does not shape up as good as the lower one, operators will complete the well in the lower zone and shut it in.

Another offshore discovery has been completed at Humble Oil & Refining Co. A-3 Tiger Pass State Lease 818, in the West Delta area, Block 27. The well was drilled to a total depth of 11,122 ft. and plugged back to 9,485 ft. On a 4-hour test through perforations at 9,475-80 ft., the well flowed 24 bbl. of 64°-gravity condensate plus 734,000 cu. ft. of gas daily through ⅛-in. choke. The well is currently shut in.

The first deep oil test of a salt dome in the floating marshes of Calcasieu Parish will be made by Kerr-McGee Drilling Co. Location is near Phoenix Lake on the east flank of a salt dome which geologists say accounts for the horseshoe bend in the Sabine River where the city of Orange is located. The company has begun erecting a rig to sink the 10,000-ft. wildcat.

Two and one-half miles south-southeast of Ritchie production, Acadia Parish, Humble Oil & Refining Co. has bottomed the 1 Mrs. Mary Klein et al at 9,140 ft., and cemented 5½-in. string at 9,139 ft.

Atlantic Refining Co. is making hole below 9,800 ft. in sticky shale at its 2 State 4204, Northwest Bayou Carlin wildcat, West Cote Blanche Bay, St. Mary Parish.

Gulf Refining Co. is drilling below 12,800 ft. in sidetracked hole in the 1 Provost-Cyre Unit in the Weeks Island area of Iberia Parish. Location is in Section 19-14s-7e, approximately 1¼ miles southeast of Shell's deep production on the northeast flank, and approximately 1¾ miles northeast of Humble's production on the southeast flank. The hole is scheduled to go to the Miocene sand around 14,500 ft.

SOUTH LOUISIANA WILDCAT FAILURE

Plaquemines Parish: Placid Oil Co. and Texas Co. 1 State of La. and LL&E Co. Unit 2, 44-19s-27e, 3 miles NE Lake Washington field, dry, TD 13,005 ft.

OHIO, KENTUCKY

Baker Area Gets Clinton Gas Well

COLUMBUS.—The Mid East Oil Co. completed its 1 S. C. Stover, Section 33, Hopewell Township, Perry County, ½ mile south of Baker pool, as a gas well with only a small showing of oil. The Clinton at 2,923-58 ft. gaged 310,000 cu. ft. of gas, natural, and 840,000 cu. ft. when shutin 2 hours after a 110-qt. shot.

Reed & Layfield found the Oriskany sand productive along the south edge of Granger Clinton pool. Their 1 G. E. Humphrey, Lot 25, Granger Township, Medina County, had sand at 2,122-27 ft. with an open flow of 400,000 cu. ft. of gas, natural.

Ditch & Gerig 1 Jane Brinkerhoff, Section 24, Congress Township, Wayne County, had 215,000 cu. ft. of gas in the Newburg at 2,895-2,966 ft. The Clinton was dry. The well was plugged back and the Newburg acidized with 1,000 gal. After blowing open for 3 hours it gaged 525,000 cu. ft. with a spray of oil.

R. E. Yocom et al shot their 12 C. Fairall, Section 8, Jackson Township, Muskingum County, with 100 qts. and in 24 hours the well flowed 80 bbl. of oil with 350,000 cu. ft. of gas.

WESTERN KENTUCKY

OWENSBORO.—I. B. Browning has found a second and more prospective producing horizon, the Hardinsburg sand, in his 1 Osborn Heirs, NE SW SE 13-N-23, located about ¾ mile south of the present southern limits of the Poole Consolidated area, 3 miles south of Poole, Webster County. Saturation in the lower horizon is at 2,004-20 ft., where a drill-stem test yielded 420 ft. of clean oil and 270 ft. of mud-cut oil without trace of water. Casing has been run to the top with an alloy section in the string opposite Palestine sand at 1,625-31 ft., where a previously reported drill-stem test gave a recovery of 50 ft. of clean oil with 50 ft. of mud. Location already has been made for a north offset.

George & Wrather and Ryan Oil Co. 1 McCann, SE NW SW 18-N-28, which is opening a new area a mile north of Glenville, in Daviess County, swabbed 3 bbl. of oil per hour in initial tests of O'Hara lime at 1,870-75 ft. Tests followed a 3,000-gal. acid treatment of the prospective pay zone.

Discovery late in November of the Reed East pool, northeastern Henderson County, near the Daviess County line, has been confirmed with a second well, Kingwood Oil Co. 2 Dunn-Leach, a location south of No. 1, the discovery well, in 15-Q-27. It pumped 21 bbl. of oil with 65 bbl. of water in the first 16 hours from the Waltersburg sand at 1,195-99 ft. The new pool is about 1½ miles east of the original 1 Reed pool, about 2 miles northwest of Newman.

WESTERN KENTUCKY WILDCAT FAILURES

Hopkins County: J. B. Murvin 1 Fowler, NW SW NE 9-K-25, dry, TD 1,390 ft.
Union County: George S. Engle 1 McKinney, SE NW SE 11-O-18, dry, TD 2,697 ft.

EASTERN KENTUCKY

ASHLAND.—In western Lewis County, 4-Y-72, H. P. Purnell et al are drilling slowly ahead at 1,483 ft. in the High Bridge (Ordovician) series. Objectives are the St. Peter and Knox formations expected within the next 200 ft. Some shows of gas have been had down to present depth.

In the extreme south-central part of the state and located in 9-C-50, Coolie Ellis is drilling at 2,109 ft. at the 1 Merley, a rank wildcat deep test for the area. Large size hole and hard resistant lime and dolomite formations have kept daily drilling progress to a minimum. The well may test lower Ordovician and possibly Cambrian sands.

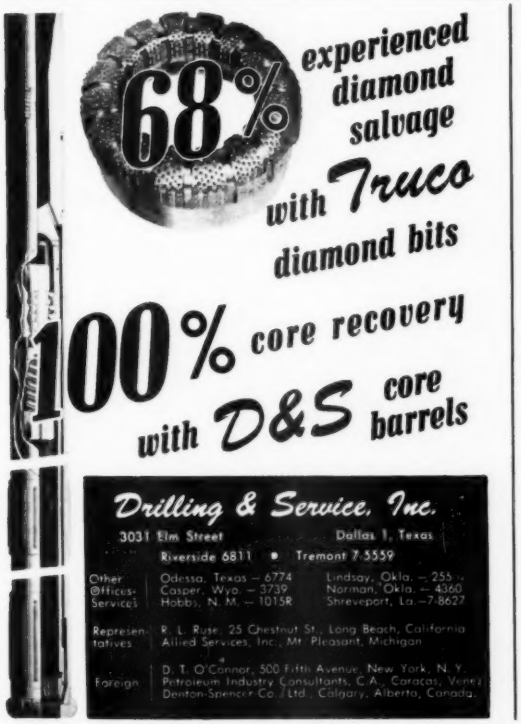
In 19-L-70, Roy Barnes et al are drilling at 1,508 ft. at 1 Nanny Campbell, a Corniferous wildcat test for north central Owsley County. No shows have been reported to date.

INDIANA

EVANSVILLE.—A half-mile southwesterly extension of production of the Blackhawk pool, Vigo County, is in prospect at Gilliam Drilling Co. 3 Lammey, SE SW SW 20-10n-8w, which is testing the pool's Devonian pay zone with casing perforated at 1,899-1,903 ft. A drill-stem test of the zone at 1,873-1,913 ft. resulted in a recovery of 330 ft. of clean oil with 30 ft. of mud-cut oil and 120 ft. of gas and oil-cut mud. The pool, opened last August, now has eight producing wells.

C. E. Skiles 1 Meier, SE NE SW 7-6s-12w, a half-mile southwest of the Bufkin pool, Posey County, found saturation in Mansfield sand (Pennsylvanian) at 1,120-40 ft., and with casing cemented on top, is waiting standard tools to drill in and test. This is about 1½ miles southeast of the same operator's 2 Ray Woelker, NE SW SW 1-6s-13w, prospective oil discovery well, located near the center of the Oliver shallow gas area, west of the Bufkin pool. At latest report, the latter well had drilled out plug and was cleaning out to test showings encountered in O'Hara lime at 2,754-59 ft. It also has saturation in the Mansfield sand at 1,236-44 ft., opposite which an alloy section was run in the casing string. Gas production in the area is from a Pennsylvanian sand around 600 ft.

About ¾ mile southeast of the Skiles prospective Bufkin extension, and northwest of the Caborne pool, Ryan Oil Co. found showings in the Kincaid (Upper Mississippian) at its 1 Egli, NE SE NE 18-6s-12w. A drill-stem test at 1,625-40 ft. in this zone yielded 30 ft. of clean oil with



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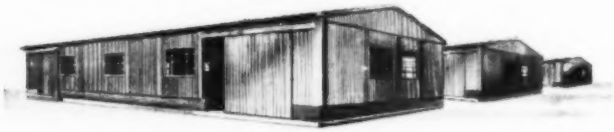

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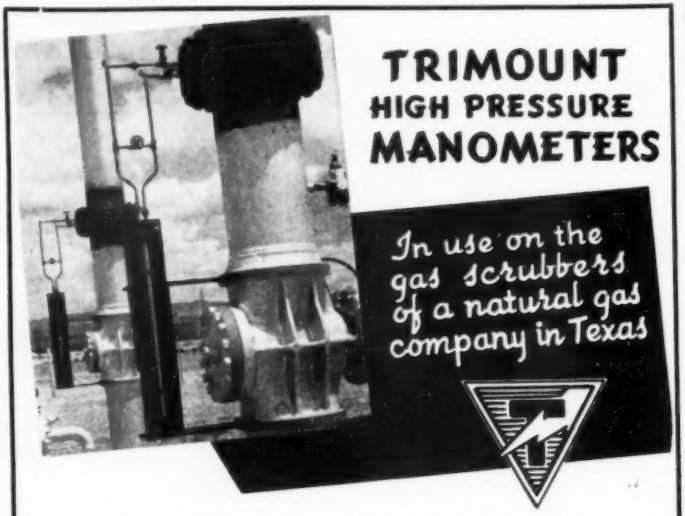

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INDIANA SUCCESSFUL WILDCAT

Knox County: John Zanetis 1 Ida B. Doty, NW SE NE 29-2n-8w, IP 18 bbl., Salem lime, 1,812-56 ft., TD 1,866 ft.

INDIANA WILDCAT FAILURE

Dubois County: B. J. Dining 1 Katterhenry, SE SE NW 34-2s-6w, dry, TD 1,086 ft.

KANSAS

New Producer Extends Huffstutter Pool Area

THE Huffstutter pool in northern Phillips County, 6 miles from the Nebraska line and western Kansas' most northerly production, is getting a half-mile extension to the northeast at Powell-Peters Drilling Co. 1 Davis, SW SW SE 32-1-18. With casing perforated at 3,486-92 ft. in Lansing lime, topped at 3,390 ft. (—1,145 ft.), the well swabbed 16 bbl. of oil per hour in the first 8 hours. Testing continues. The pay zone was treated with 5,000 gal. of acid. This will make the eighth well for the pool, opened last September. Four rigs are running.

Another new pool is in the making in Barton County, where Keyes Drilling Co. 1 Kimpler, SE SE NE 31-18-11, has started tests of promising oil shows found in the Arbuckle lime, topped at 3,424 ft. (—1,596 ft.), and in which casing was run to 3,427 ft. Rotary hole was carried to 3,432 ft. Located 1½ miles northwest of the St. Peter pool, it is 3 miles northeast of the lately opened Cheyenne View pool.

Wildcatting efforts in the extreme western part of Kansas, where pools so far found are few and far between, received a little encouragement the past week as a result of small showings encountered by The Texas Co. in its 1 Lang, NE NE SW 1-20-34, southwestern Scott County. Showings were in sand, believed to be in the Cherokee section, at 4,510-70 ft., where a drill-stem test gave a recovery of 45 ft. of oil-cut mud. Bottom-hole pressure was 900 psi. The wildcat is one of two now drilling in the county, and is located about 5 miles west of the Shallow Water pool, now inactive, and the county's only production (Mississippian). The Nunn pool, in northern Finney County, north of the Hugoton gas area, and next nearest production, is about 8 miles to the south.

KANSAS SUCCESSFUL WILDCAT

Harper County: Drillers Gas et al 1 F. W. Grabs, NE NE NE 13-31s-9w, pumped 32 bbl. of oil per day from Mississippian at 4,400-14 ft.; Lansing 3,634 ft., TD 4,449 ft.

KANSAS WILDCAT FAILURES

Barton County: Finston Bros. 1 Essmiller, NW NW SE 4-19s-14w, dry, TD 3,580 ft., anhydrite 845 ft., Hoxbar 3,134 ft., lime 3,220 ft., Lansing 2,234 ft., basal Kansas City 3,468 ft., conglomerate 3,488 ft., Gorham 3,529 ft., Arbuckle 3,532 ft.

W. L. Hartman 1 Hammecks, SE NE SE 25-19s-12w, dry, TD 3,380 ft., anhydrite 598 ft., Hoxbar 2,961 ft., lime 3,080 ft., Lansing 3,100 ft., Arbuckle 3,359 ft.

Ben C. Hyde, Jr., et al 1 Hagen, SW SE NE 29-20s-11w, dry, TD 3,403 ft., anhydrite 610 ft., Lansing 3,117 ft., conglomerate 3,391 ft.

Chase County: C. L. Seibel 1 Hindren, C S/2 SW SW 15-21s-6e, dry, TD 3,528 ft., Lansing 1,955 ft., basal Kansas City 2,343 ft., Marmaton 2,455 ft., Mississippi lime 3,145 ft.

Ellis County: W. L. Hartman 1 Kroeger, SW SW SW 26-12s-20w, dry, TD 3,925 ft., anhydrite 1,560 ft., Topeka 3,225 ft., Hoxbar 3,477 ft., Lansing 3,514 ft., conglomerate 3,841 ft., Arbuckle 3,899 ft.

M. B. Armer Drilling Co. et al 1 Schrant,

SW SW SW 23-14s-16w, dry, TD 3,460 ft., anhydrite 945 ft., Hoxbar 3,087 ft., Dodge 3,107 ft., Lansing 3,135 ft., conglomerate 3,382 ft., Arbuckle 3,460 ft.

Pottawatomie County: Anderson-Prichard and Stanolind Oil & Gas 1 MacFarland, NE NE SE 14-8s-11e, dry, TD 3,495 ft., Howard 787 ft., Topeka 840 ft., Hoxbar 1,137 ft., Lansing 1,339 ft., Kansas City 1,466 ft., basal Kansas City 1,683 ft., Mississippi chert 2,405 ft., Mississippi lime 2,437 ft., Kinderhook 2,488 ft., Hunton 2,718 ft., Maquoketa 3,187 ft., Viola 3,273 ft., Decorah 3,359 ft., Simpson shale 3,399 ft., Simpson sand 3,417 ft., granite 3,486 ft.

Pratt County: Harbar Drilling Co. et al 1 Combs, SE SW SW 25-29s-13w, dry, TD 4,728 ft., Hoxbar 3,694 ft., Douglas 3,793 ft., Lansing 3,861 ft., Mississippian 4,328 ft., Kinderhook 4,382 ft., Viola 4,444 ft., Simpson 4,570 ft., Arbuckle 4,723 ft.

Rooks County: N. C. R. A. 1 Hilgers, SE SE NE 5-10s-18w, dry, TD 3,782 ft., anhydrite 1,590 ft., Topeka 3,157 ft., Hoxbar 3,362 ft., Lansing 3,401 ft., Arbuckle 3,757 ft.

Russell County: Earl Wakefield et al 1 Herber, SW SW NE 19-15s-11w, dry, TD 3,403 ft., anhydrite 732 ft., Howard 2,605 ft., Topeka 2,675 ft., Hoxbar 2,925 ft., Lansing 3,012 ft., conglomerate 3,317 ft., Arbuckle 3,399 ft.

Woodson County: E. E. Kilby 1 Claussen, SW SW NW 9-24s-15e, dry, TD 1,600 ft., Bartlesville 1,400 ft., Mississippian 1,546 ft.

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ILLINOIS

Two New Illinois Areas Get Active Development

MATTOON.—Two of the district's most recently opened producing areas already are receiving active developments and are being proved up rapidly. One is in 32-3n-11w, at the southeast end of the old Lawrence pool, 4 miles south of Lawrenceville, in southern Lawrence County. The other is in 5-7s-5e, 2½ miles southwest of Rural Hill, in the southwest corner of Hamilton County.

The new Lawrence County pool was opened the middle of November by R. A. Harris and associates in their 1 Akin, NW NE SW 32-3n-11w, which was completed flowing at the rate of 1,650 bbl. of clean oil daily from O'Hara lime at 1,863-1,901 ft. It still is flowing about 800 bbl. per day. Since then, the same operators have completed a Cypress sand well, proving two pay zones for the area, at their 1 Oscar Leighty, SE SW NW of the same section, a diagonal northwest offset to the discovery well. This well failed to get production in the O'Hara and was plugged to the Cypress at 1,590-1,610 ft. and made a 60-bbl. pumper from that pay.

The same operators' 1 Finley, a south-

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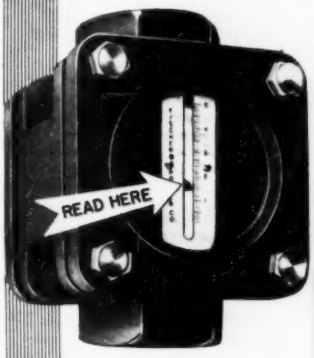

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west diagonal offset to the discovery well, found saturation in both the Cypress and the O'Hara, the former at 1,590-1,603 ft. and the latter at 1,825-29 ft. Casing was set on the deeper zone, which now is being tested to confirm the production of the discovery well. An alloy section was run in the casing string opposite the Cypress, which will be tested later for a confirmation well of this zone.

Production from a third zone, the McClosky lime, now is in prospect with Magnolia Petroleum Co. testing this pay at 1,835-39 ft. in its 1 Dining, a north offset to the Harris 1 Akin, O'Hara discovery well and an east offset to the Harris 1 Leighty, the Cypress discovery well.

Drilling is under way at three additional locations in the immediate area. Less than a half-mile to the northeast, where last October R. C. Mitcheltree opened another productive spot, three other operations are under way, two of which are now testing showings encountered in the McClosky lime, the same zone being tested by Magnolia in its Dining well. The discovery, and so far only producer in that area, was completed in the Rosiclare.

In southwestern Hamilton County, where another new producing area was opened late in November by J. William Everhart in his 1 Wesley Foundation, SW SW SW 5-7s-5e, completed as a 600-bbl. well in Aux Vases sand at 3,200-15 ft., two additional wells already are being completed to confirm the discovery. The same operator's 2 Wesley Foundation, in the NE SW SW of the section (northeast of the discovery well), has saturation at 3,253-57 ft. and 3,269-77 ft., and is testing. B. J. Taylor 1 Lowe, NE NE NE, same section, a diagonal southwest offset, swabbed at the rate of 200 bbl. per day while testing the pay at 3,198-3,210 ft. Five additional tests are drilling. One of these, Phillips Petroleum Co. 1 Angus, SE SE SE 6, east offset to the discovery well, found showings in the Benoist sand, a prospective second pay zone for the area. Two drill-stem tests were made. The first at 3,043-51 ft., resulted in a recovery of 35 ft. of mud-cut oil. The second, taking in an additional 7 ft. to 3,058 ft., gave up 5 ft. of clean oil plus 55 ft. of mud-cut oil.

Perry Fulk 1 Tidball, NE NW SW 15-1s-8e, located in the southeastern sector of the Clay City-Noble Consolidated pool, 5 miles northeast of Fairfield, in Wayne County, recovered 2,800 ft. of clean oil in a drill-stem test of the Rosiclare at 2,175-94 ft. This is a new pay zone for the area with nearest wells, a half-mile distant, producing from the Aux Vases. Hole was deepened to 3,222 ft. but has been plugged back to this zone, on which casing has been run for completion.

ILLINOIS SUCCESSFUL WILDCAT

Hamilton County: J. W. Everhart 1 Wesley Foundation, SW SW SW 5-7s-5e, IP 529 bbl., Aux Vases 3,206-15 ft., TD 3,215 ft. (Discovery well new pool).

ILLINOIS WILDCAT FAILURES

Bond County: T. R. Kerwin 2 Henry Heirs, SE NE SW 36-4n-3w, dry, TD 1,156 ft.

Clark County: F. B. Cline 1 Blankenship, SE SE SE 16-11n-12w, dry, TD 2,608 ft.

Clinton County: C. K. Stein 1 Nierman, SE NE SE 16-2n-2w, dry, TD 1,322 ft.

Crawford County: Illinois Mid-Continent Co. 1 Long, NE NW SW 4-5n-10w, dry, TD 2,249 ft.

Edgar County: Caro Oil & Gas Co. 1 Weber, SE SW NE 20-13n-12w, dry, TD 1,023 ft.

Hamilton County: Perrine & Perrine 1 Plowman, SW NW SE 21-4s-5e, dry, TD 3,401 ft.

Jasper County: J. W. Rudy 1 Dobbins, NW SW NE 33-7n-8e, dry, TD 3,170 ft.

Moultrie County: C. T. Smith 1 Phipps, NW SE SE 15-12n-6e, dry, TD 2,087 ft.

Saline County: George S. Engle 1-A Simpson, NW NW NE 17-8s-7e, dry, TD 3,035 ft.

Wabash County: J. B. Buckman 1 Nash et al, NW NW NW 26-2s-13w, dry, TD 2,000 ft.

Wayne County: W. O. Lucas 3 R. Lucas, SE SW NW 7-1n-6e, dry, TD 3,152 ft.

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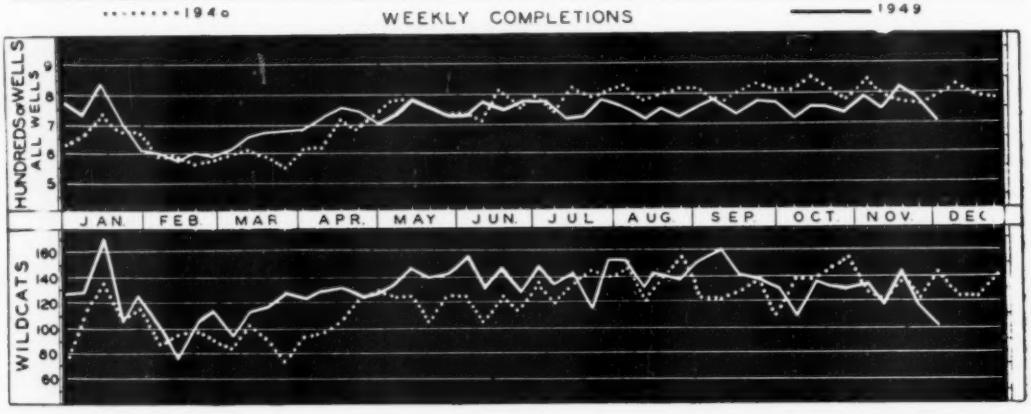
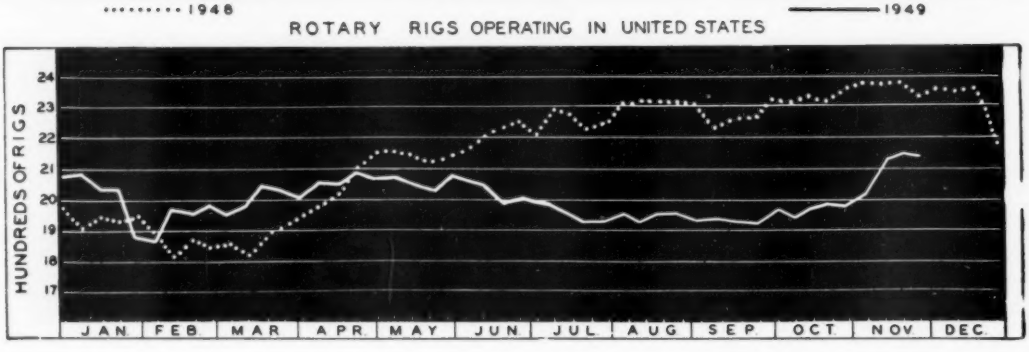
	Total of all wells					Dec. 3		Wildcat completions and discoveries					Cumulative total, 1949				
	Comp.	Oil	Gas	Dry	Footage	1949	1948	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	12	6	0	*6	17,012	692	1,241	0	0	0	0	0	0	0	1	0	1
Pennsylvania	23	5	8	†10	41,891	1,732	2,694	0	0	0	0	0	0	0	4	2	6
West Virginia	7	1	4	2	17,662	474	783	0	0	0	0	0	1	0	12	11	24
Ohio	20	8	5	7	42,568	1,007	1,243	0	0	0	0	0	2	0	2	29	33
Indiana	25	9	1	15	48,599	1,204	988	1	0	0	1	2	34	0	4	212	250
Kentucky	25	12	0	13	38,857	949	830	0	0	0	2	2	27	0	0	73	100
Illinois	64	34	0	30	152,038	2,529	2,205	1	0	0	11	12	62	0	2	443	507
Michigan	14	8	0	6	28,950	929	771	1	0	0	6	7	27	0	3	285	315
Kansas	69	32	11	‡26	218,051	3,040	2,876	1	0	0	11	12	70	0	9	379	458
Neb., Mo., Iowa	2	2	0	0	5,024	31	55	0	0	0	0	0	2	0	0	17	19
Oklahoma	89	53	7	§29	304,753	3,979	3,818	1	0	0	7	8	132	13	16	561	722
Texas	236	158	6	72	973,126	12,087	10,964	4	1	0	37	42	366	41	107	2,062	2,576
North Central (Dist. 7-B & 9)	101	67	1	‡33	283,399	4,062	3,414	3	0	0	14	17	166	0	19	820	1,005
West (Dist. 7-C & 8)	48	40	0	8	242,685	2,955	2,921	0	0	0	6	6	57	1	6	248	312
Panhandle (Dist. 10)	10	5	2	3	27,861	884	599	0	0	0	0	0	1	0	1	9	11
Eastern (Dist. 5, 6, & 6-P)	11	4	1	6	38,160	714	547	0	0	0	4	4	11	4	3	144	162
Gulf Coast (Dist. 2 & 3)	44	32	0	12	268,416	1,773	1,734	1	1	0	7	9	73	29	44	344	490
Southwest (Dist. 1 & 4)	22	10	2	10	112,605	1,699	1,749	0	0	0	6	6	58	7	34	497	596
Louisiana	32	23	3	6	143,107	2,095	2,119	0	0	0	2	2	52	18	4	188	262
Northern	24	18	3	3	76,798	1,264	1,425	0	0	0	1	1	5	2	0	91	98
Southern	8	5	0	3	66,309	831	694	0	0	0	1	1	47	16	4	97	164
Arkansas	5	3	0	2	16,055	299	263	0	0	0	1	1	3	0	1	64	68
Mississippi	5	1	0	4	36,579	309	382	0	0	0	3	3	5	2	1	98	106
Southeastern States	0	0	0	0	0	42	42	0	0	0	0	0	1	0	0	34	35
Montana	0	0	0	0	0	263	301	0	0	0	0	0	4	0	2	31	37
Wyoming	15	6	0	9	61,912	556	519	0	0	0	3	3	23	0	1	108	132
Colorado-Utah	3	2	0	1	17,276	128	198	0	0	0	0	0	2	0	0	63	65
New Mexico	6	3	1	2	25,954	460	545	0	0	0	1	1	13	1	2	48	64
California	50	38	4	8	222,069	2,414	2,601	0	0	0	7	7	35	0	7	418	460
Dakotas	0	0	0	0	0	18	2	0	0	0	0	0	0	0	0	15	15
Total United States	702	404	50	248	2,411,483	35,237	35,440	9	1	0	92	102	861	75	178	5,141	6,255
Total previous week	776	448	61	267	2,752,981			17	0	2	97	116	852	74	178	5,049	6,153
Total December 4, 1948	790	457	50	283	2,856,298			15	2	3	123	143	811	70	228	4,719	5,828

Service wells included: *6, †10, ‡2, §1





DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 3 crude oil	B. of M. Nov. demand	Nov. 26 crude oil
Alabama	1,350	1,200	1,350
Arkansas	73,650	85,000	73,900
California	866,700	850,000	867,900
Colorado	62,750	73,000	66,400
Eastern	54,200	60,900	57,700
Florida	900	1,000	975
Illinois	172,600	185,000	182,200
Indiana	27,900	29,000	29,100
Kansas	294,200	302,000	290,150
Kentucky	24,900	23,000	24,900
Louisiana	533,850	530,000	530,000
North Louisiana	120,650		118,600
South Louisiana	413,200		411,400
Michigan	46,100	45,000	46,900
Mississippi	96,000	108,000	97,250
Montana	26,000	25,000	26,200
Nebraska	1,300	700	1,150
New Mexico	132,425	138,000	132,900
Oklahoma	416,750	415,000	426,500
Texas	2,086,525	2,230,000	2,169,425
Dist. 1 (Southwest)	26,750		27,300
Dist. 2 (Southwest)	125,650		132,425
Dist. 4 (Southwest)	196,000		204,200
Dist. 3 (Gulf Coast)	386,300		400,925
Dist. 5 (Eastern)	35,950		37,575
Dist. 6 (Eastern)	89,075		92,950
East Texas	257,325		273,300
Dist. 7-C (West)	53,500		55,325
Dist. 8 (West)	618,725		645,975
Dist. 7-B (W. Central)	62,400		63,150
Dist. 9 (N. Central)	142,500		144,000
Dist. 10 (Panhandle)	92,350		92,300
Utah	3,100	1,200	3,300
Wyoming	139,050	127,000	135,900
Total United States	*5,060,250	5,230,000	5,164,100
Change from prev. week, down	103,850		
Canada	59,095		65,010
Total U. S. production January 1-December 3			†1,711,399,645 bbl.
Same period last year (crude plus cond.)			1,837,411,775 bbl.

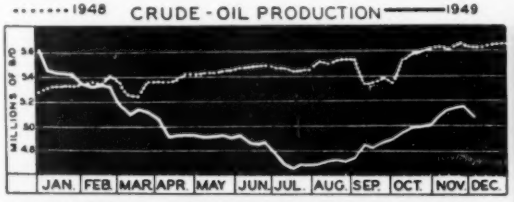
*Not incl. 83,545 bbl. condensate. †Incl. 27,704,485 bbl. condensate.

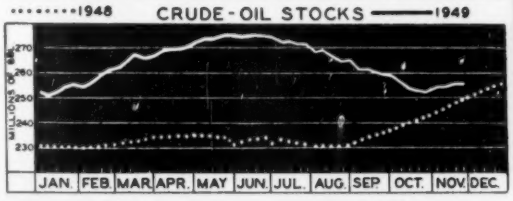
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

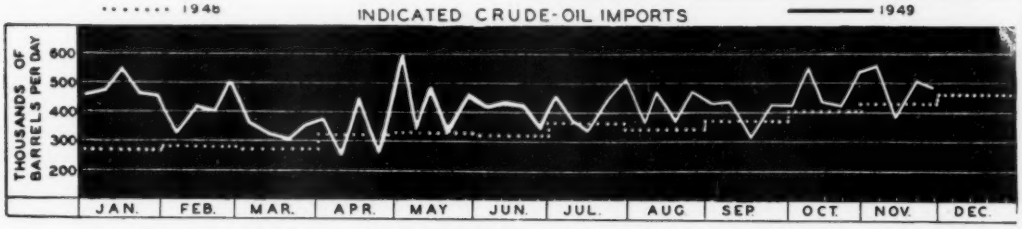
(Thousands of barrels)

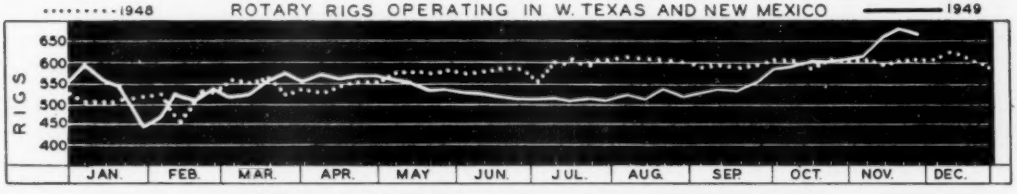
	Nov. 26, 1949	Nov. 19, 1949	Nov. 27, 1948
Pennsylvania Grade	3,031	3,150	2,944
Other Appalachian	1,865	2,249	1,276
Illinois, Indiana, Michigan	11,681	11,184	11,685
Arkansas	2,632	2,687	3,516
Louisiana	13,483	13,162	12,331
North	3,005	2,913	3,067
Gulf	10,478	10,249	9,264
Mississippi	2,408	2,350	2,920
New Mexico	7,286	7,476	5,918
Oklahoma and Kansas	37,094	37,065	36,579
Texas	117,372	117,365	115,188
East Texas	16,853	17,061	15,553
West Texas	44,306	44,526	43,682
Texas Gulf	30,068	30,038	29,050
Other Texas	26,145	25,740	26,903
Rocky Mountain	13,956	13,976	11,496
California	37,458	37,653	34,347
Foreign	8,143	8,057	6,046
Total United States	256,409	256,374	244,246

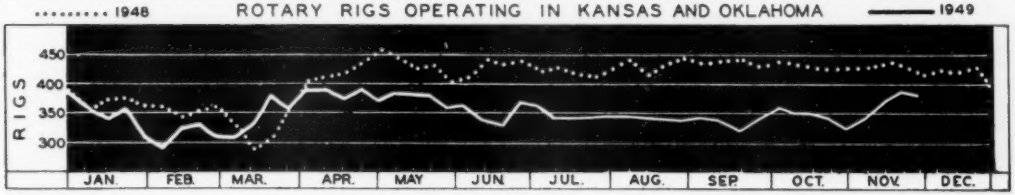
*Bureau of Mines.











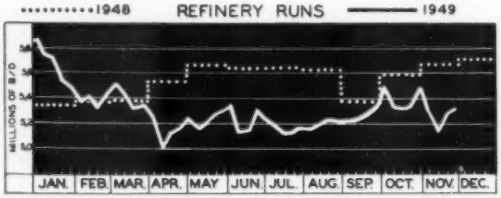
Refining Statistics

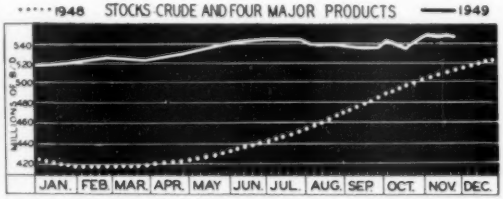
A.P.I. REFINERY REPORT, NOVEMBER 26

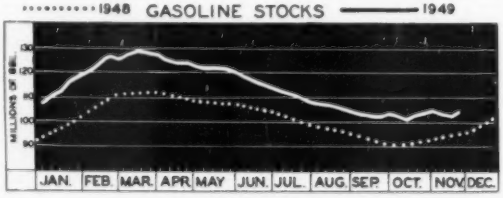
(Thousands of barrels)

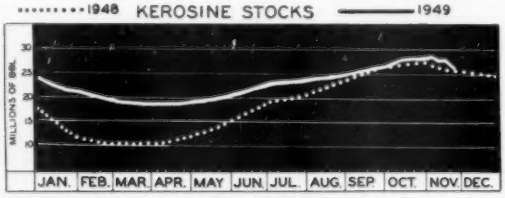
District	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, November 1948				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	774	351.4	30.1	175.9	200.4	22,954	11,169	30,273	10,207	865	303.8	43.6	177.5	220.7
Appalachian:														
District 1	93	49.3	4.6	13.3	10.3	2,869	409	910	442	101	43.3	7.6	12.5	13.5
District 2	60	28.3	3.6	6.1	12.6	1,341	134	237	192	71	35.5	3.4	10.4	15.9
Ind., Ill., Ky.	925	490.3	61.4	142.0	166.0	21,316	5,189	13,711	4,450	967	486.9	67.2	141.7	151.7
Okla., Kans., Mo.	433	245.4	11.8	89.9	56.3	9,855	1,535	6,420	1,763	437	241.2	22.0	84.1	75.2
Inland Texas	226	150.0	7.6	28.0	43.0	4,017	820	1,121	1,408	240	157.6	16.5	22.4	59.1
Texas Gulf Coast	1,269	561.3	106.6	227.6	232.8	14,304	3,502	16,005	7,587	1,387	622.6	117.4	338.5	244.1
La. Gulf Coast	436	220.6	47.0	115.1	58.0	5,814	1,614	5,242	2,457	451	190.0	58.2	99.5	74.7
N. La. and Ark.	78	34.1	7.6	9.7	16.3	2,378	402	709	347	85	32.5	8.8	12.7	19.0
Rocky Mountain:														
New Mexico	12	7.1		1.6	2.7	85	50	97	34	13	6.4	0.3	1.8	3.9
Other Rocky Mtn.	165	79.3	8.6	37.1	36.9	2,585	394	1,950	613	151	69.6	3.6	28.9	38.1
California	860	383.4	1.5	149.6	322.4	17,199	851	15,120	37,587	961	361.9	13.0	140.8	375.6
Nov. 26, 1949	5,331	2,600.5	290.4	995.9	1,157.7	104,917	26,069	91,795	67,087	5,729	2,551.3	361.6	1,070.8	1,291.5
Nov. 19, 1949	5,292	2,593.9	318.1	1,016.7	1,173.4	103,380	27,526	92,652	68,620					
Nov. 27, 1948	5,778	2,473.9	375.7	1,057.4	1,368.9	93,802	26,454	80,375	63,960					

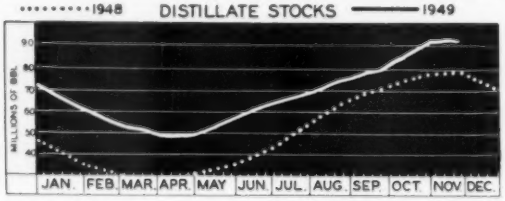
*At refineries including natural blended. †Finished and unfinished.

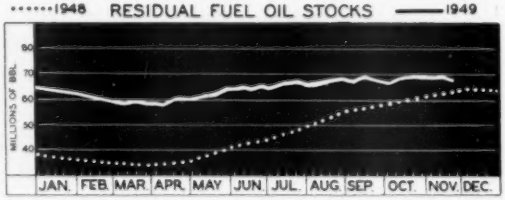


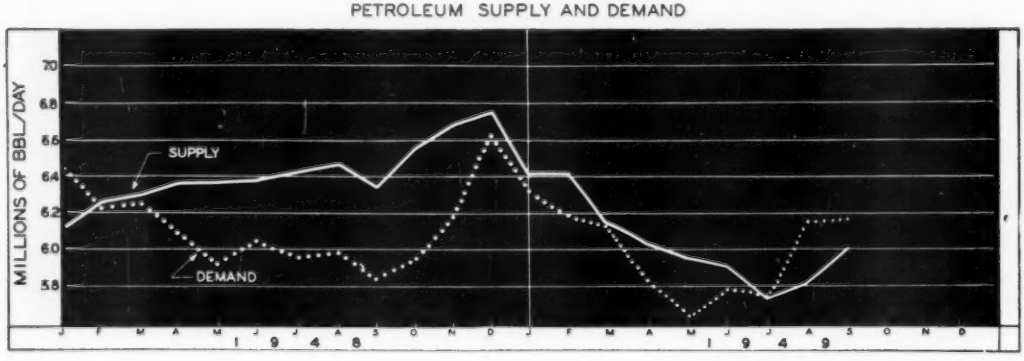












CRUDE PRICES GRAVITY SCHEDULE

Gravity—	Calif. Hill, Signal	Kansas homa, Okla-	Tex.* Coast Gulf	Tex.† West
18-18.9	$1.53			
19-19.9	1.63			
20-20.9	1.73	$2.25		$2.12
21-21.9	1.82	2.27		2.14
22-22.9	1.92	2.29		2.16
23-23.9	2.02	2.31		2.15
24-24.9	2.12	2.33	$2.56	2.20
25-25.9	2.22	2.35	2.58	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. Above changes do not include recent reductions of a few buyers applying principally to low-gravity grades.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.65
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	3.40
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above

RESIDUAL fuel prices are firming in all areas east of California with best prospects for major price increases in the Mid-Continent and Great Lakes areas. Contract railroad fuel in the Mid-Continent is still moving at 90 cents a barrel, but most suppliers believe that December will be the last month at that price. Little or no low-sulfur material is available on the open market and the general scarcity of residual fuel is indicated by current reports of stocks in primary storage. In the combined Oklahoma-Kansas and Illinois-Indiana districts, residual stocks on November 26 amounted to 6,413,000 bbl. compared with 9,023,000 bbl. at the end of November last year and 7,366,000 bbl. on November 30, 1947.

Distillate fuels are moving better in the Mid-Continent area. One supplier reported the "best batch of shipping orders of the season" during the week ended December 2.

East Coast residual market is following the pattern that goes with rising demand. The market was sluggish after the last 15-cent increase about the middle of October, with a quantity of material moving at the old price. Sales at the low of the market have diminished and the New York Harbor barge price is firm at $2.05 a barrel.

Cooler weather in the northeastern states has given the distillate market a firmer tone. The harbor low remained at 7.75 cents a gallon for No. 2 throughout most of November but now has moved up to 7.9 cents. This represents the general posting of 8.5 cents less the voluntary discount of 0.6 cent per gallon. Some suppliers are expecting this discount to be withdrawn soon if cold weather continues.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of December 5, 1949. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Tex. Gulf Coast
Regular gasoline, 74-76 octane	9½-10	10.625-11.1	9½-9¾
Premium gasoline, 78-80 octane	10⅜-11	12-12.1	10½-10¾
42-44 w.w. kerosine	7¾-8¼	8.3-8.9	7½-8
No. 2 straw fuel oil	6¾-7	7.9-8.5	7-7¼
No. 6 residual	$0.95-1.00	$2.05	$1.65-1.75

NATURAL GASOLINE

	Group 3	North Texas	N. La
Grade 26-70	5⅞	5⅜	5½
Grade 18-55	7.1	6.5	6.8

LUBRICATING OILS SOUTH TEXAS

200 vis., No. 2-3 neutral	10.5
750 vis., No. 3-4 neutral	12.75
2,000 No. 5-6 neutral	14-14.5

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	17-19
200 vis., No. 3 neutral, 0-10 pp.	11.5-14

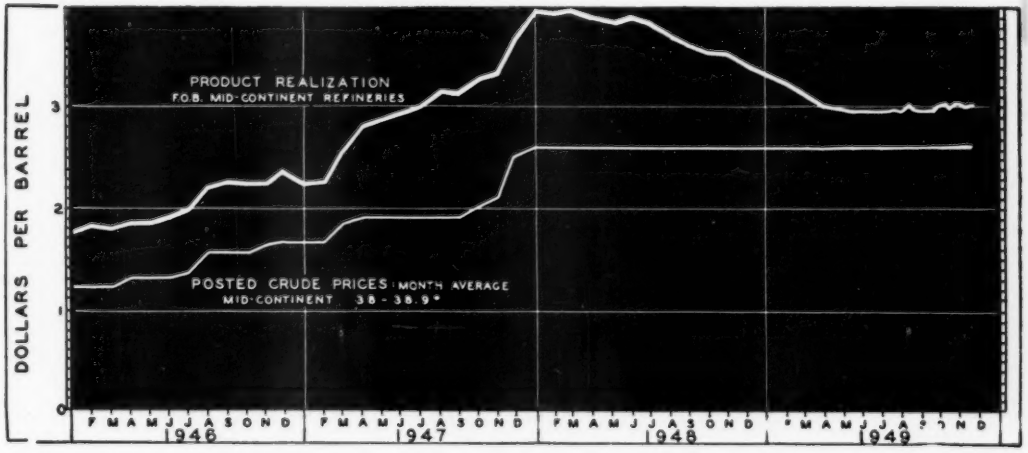
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	19.5-20.5
180 vis., 0 p.t. neutral	20.5-21.5

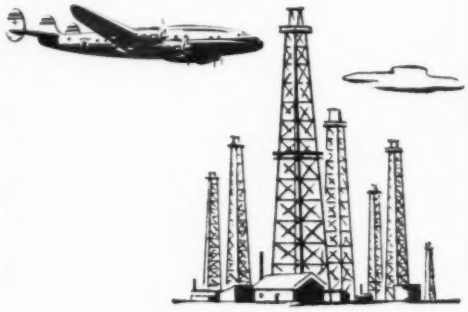
WAX

Mid-Continent

132-134 A.M.P.	4.25


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
DOLLARS PER BARREL
0
1
2
3
F M A M J J A S O N D
1946
F M A M J J A S O N D
1947
F M A M J J A S O N D
1948
F M A M J J A S O N D
1949

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil



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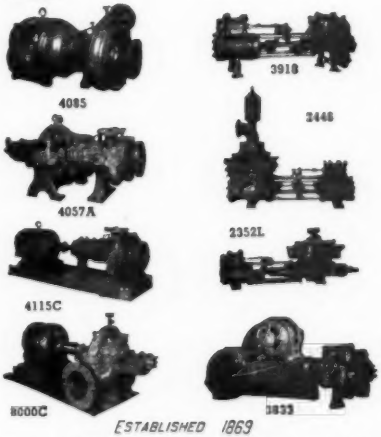

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DEAN BROTHERS PUMPS INC.

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EQUIPMENT MEN . . . in the News

Pughe Goes to Wheland as Manager, Manufacturing

E. W. PUGHE

Earl W. Pughe has joined Wheland Co., Chattanooga, as manager, manufacturing division. This division includes the design and production of Wheland oil-field drilling equipment.

Pughe has more than 30 years of experience as a production executive. He was with Chevrolet Division of General Motors for 22 years. During that time his duties included management of three Chevrolet plants. Immediately prior to his connection with Wheland, Pughe had been assistant to the president, Dana Corp.

Gordon P. Street, president of Wheland, stated that Wheland's greatly accelerated research and design activities in the oil-field drilling equipment division and the continued upswing of activity in the manufacturing division will continue at a faster pace under Pughe.

Wheland has made dramatic strides in modernizing its equipment. New Wheland rigs are now in the oil fields and further improvements and refinements are constantly being developed. Current manufacturing schedules are the largest in the company's history and further expansion is scheduled.

Two Houston Oil Well Service Firms Merge

Two leading companies, Atlas Well Service Corp. and Perforating Guns Co., engaged in oil-well perforating services, have merged their operations into a new company, Perforating Guns Atlas Corp.

Executive offices and main plant of the new corporation will be at the Houston plant of the merged companies, Perforating Guns. The former plant of Atlas Well Service, also in Houston, will be maintained temporarily as a branch of the new corporation. The personnel and facilities of both merged firms will continue intact.

Officers of Perforating Guns Atlas are: Paul Charrin, president; J. H. Castel, vice president; L. E. Minor, vice president; and J. W. Dunham, vice president. George E. Thompson and F. L. Tucker will continue jointly in charge of sales of the new company.

Perforating Guns Co., prior to the merger, had specialized in "jet gun" perforation, patterned after the principle of the bazooka, now famous for its effectiveness in World War II. The other firm, Atlas Well Service, developed one of the most powerful bullet guns for oil-well completions.

The new corporation will continue operation of the 12 branch offices of its two predecessors. These branches are located at Alice, Beeville, Victoria, Carthage, and Odessa, Tex.; Hobbs, N. M.; Pauls Valley, Okla.; El Dorado, Ark.; Brookhaven, Miss.; and Lake Charles, Lafayette, and Harvey, La.

Webb Returns to Venezuela

Orlan Webb, export service engineer for Baker Oil Tools, Inc., has spent his home leave fishing along the Texas Gulf, and visiting friends in the oil business in Southern California. Prior to his work with Baker, Webb filled a foreign assignment with Aranca in Saudi Arabia. Webb returned to his headquarters at Santa Barbara in Eastern Venezuela late in October.

Reed Transfers Chandler To Foreign Division

A. G. CHANDLER

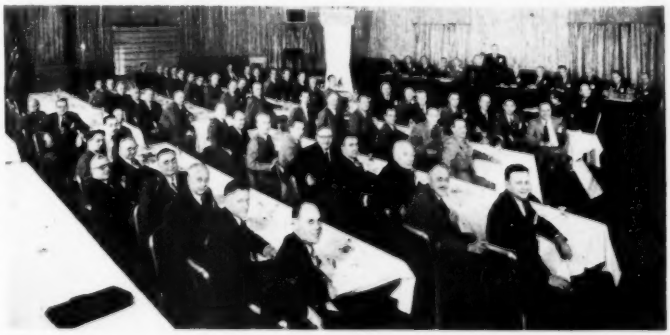
Transfer of A. G. Chandler to the foreign division of Reed Roller Bit Co. has been announced. Chandler was formerly Gulf Coast division manager for Reed. Concurrently with the transfer, Chandler left for New York City where he will work with H. B. Book, head of the export division of Reed. He will then leave for an extensive trip to London, The Hague, Paris, Rome, Egypt, the Middle East, India-Pakistan, Netherlands East Indies, and Australia.

Bovaird Announces Election of Officers

Bovaird Supply Co. has announced the election of the following officers at its annual meeting: David D. Bovaird, president; Frank D. Bovaird, vice president; Roscoe G. Ayers, vice president and general manager of sales; R. M. McMahan, treasurer and secretary; M. B. Park, assistant secretary.

Directors reelected include Davis and Frank Bovaird, Ayers, McMahan, and A. E. Booth. Raymond E. Batchelor, general manager of stores, was

Dresser Industries Hold Sales Meeting



On November 6 about 70 sales and engineering officials representing 11 subsidiary companies of Dresser Industries, Inc., attended a luncheon followed by an afternoon business meeting in the Stevens Hotel in Chicago, just prior to the A.P.I. convention. The meeting was presided over by J. B. O'Conner, executive vice president of Dresser Industries

also elected to membership on the board of directors.

Two factors influenced the announcement of the authorizing of the opening of two new stores: confidence in the future and the company's policy to improve the services provided for its customers. The new stores will be located at Snyder, Tex., and Great Bend, Kans.

Freeman Promoted to General Manager of Stores

Wendell M. Jones, vice president, Bethlehem Supply Co. of California, has announced that J. R. B. Freeman,

J. R. B. FREEMAN

F. T. MERKEL

the company's district manager at San Francisco, will be promoted to general manager of stores.

Freeman, a graduate of Stanford University, has been manager of San Francisco operations since 1947, having been promoted at that time from the position of sales engineer at Los Angeles. His new headquarters will be at the general offices in Los Angeles.

Frank T. Merkel, sales engineer in the San Francisco office since 1940, will become district manager of the San Francisco area. Merkel is well known among the refinery men in California and has broad experience in refinery construction.

Cuilty Joins I.X. as Foreign Representative

F. L. Cuilty recently joined the staff of Independent Exploration Co., Houston, as foreign-relations representative for Latin America. He will office in Mexico City. Cuilty's association with the petroleum industry includes work with Guaranty Trust Co. of New York and with Doheny interests in Mexico, where he was assigned to Huasteca Petroleum Co. and Mexican Petroleum Co. of California. Later he joined Standard Oil Co. (N. J.), serving in New York and London, and specializing in Latin-American business.

Mason is McKissick Rocky Mountain Representative

J. A. Mason, Casper, Wyo., has been appointed Rocky Mountain representative for McKissick Products Corp., Tulsa. Mason will operate out of Casper. He also represents McKissick in the Canadian area. A complete stock of McKissick blocks is maintained in Casper at the L. T. Mason warehouse.

Norgren Names New Agent And Factory Manager

Paul E. Lee, manager of Arrow Sales Co., Tulsa, has been named representative of C. A. Norgren Co., according to J. M. Evans, sales manager of the Denver firm.

Simultaneously, Carl A. Norgren, president of C. A. Norgren, announced the appointment of Edward H. Roos as factory manager.

Arrow Sales specializes in pneumatic equipment for oil-industry use. The company will handle the entire Norgren line of pneumatic products, including oil fog lubricators, air filters, pressure regulators, valves, hose couplings, and hose assemblies, throughout Oklahoma.

Roos, a graduate of Ohio State University, formerly served as works manager of Imperial Division, Oilwell Supply Co., at Oil City, Pa., and prior to that was with Wilson-Snyder Manufacturing Corp.

McEvoy Names Three New Sales Representatives

The addition of three men to the sales organization of McEvoy Co. has been announced. Hugh D. (Pappy) Start will assist in covering Houston and the Gulf Coast territory as a sales engineer. Start has had

H. D. START

R. B. FOSTER

A. J. FELSCHER

over 20 years of experience in the manufacturing, selling, and engineering of well-head equipment.

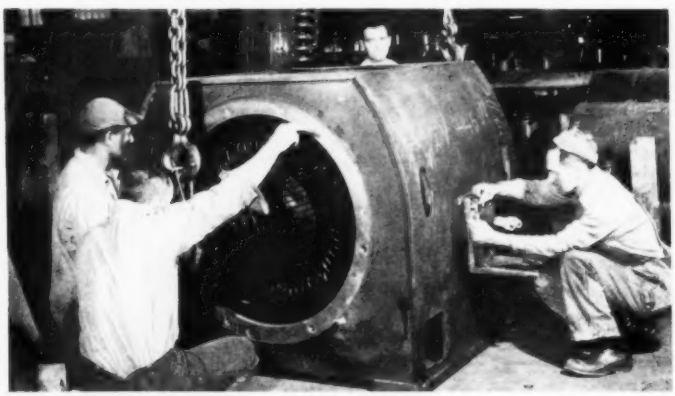
R. B. (Whitey) Foster will represent McEvoy in the Mid-Continent area. He will assist Lawrence G. Wood as sales engineer with headquarters in Oklahoma City. Foster acquired much of his experience through association with supply stores in Oklahoma City.

Arthur J. Felscher, formerly of the Houston territory, has been assigned to Alice, Tex., as a sales engineer. He will assist H. M. Stanley in the Southwest Texas area on gas-lift and well-head work.

Crescent Changes Name to Indicate Major Products

Crescent Tool Co. has changed its name more accurately to describe its major product. The new name, Crescent Hydraulic Crane Co., Inc., is indicative of the products the company is now selling nationally. The Long Beach, Calif., manufacturer has not changed its address.

It's a Tight Fit at Westinghouse Electric Corp.



Slipping the rotor into place is a crucial step in the manufacture of this 2,000-hp. motor being built at the Sunnyvale, Calif., plant of Westinghouse Electric Corp. for use on the Big Inch pipe line. There is 1/8-in. clearance between rotor and stator surrounding it

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads, 12 cents a word. Minimum charge, $3.00 per insertion.
Centered Line, any ad, $1.00.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

DISPLAYED, PER INCH

$12.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

All classified advertising payable in advance.
10% Discount if 3 insertions are ordered at one time.
COPY DEADLINE, 9:00 a.m. Monday prior to each week's issue.

THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

EQUIPMENT FOR SALE

FOR SALE: Lacoste-Romberg gravity meter complete with many accessories and in good operating condition. Available for immediate delivery. $3,000.00 f.o.b. Houston, Texas. Box D-309, The Oil and Gas Journal, Tulsa, Oklahoma.

ROTARY special 5,000′ used outfit complete with 4,500′ of 4½″ drill pipe. Ideal unitized draw works $18,500.00. Also core drills, spudders, tools, cable. We handle new and used well drilling equipment. We rent fishing tools. Pressey & Son, Pueblo, Colo.

FOR SALE: Approximately 25 miles 4″ OD plain end pipe in line. Public Service Corp. of Texas, 902 Burk Burnett Bldg., Fort Worth, Texas.

CARDWELL 6,000-ft. twin-engine drawworks, two years old, never drilled deeper than 3,400 ft., A-1 condition, D-13000 Caterpillars. Burgess-Manning snubbers, automatic makeup and breakout catheads, pump takeoff, coring drum. Now operating Illinois. Can finance. Keoughan Drilling Co., Fairfield, Illinois.

FOR SALE: One 6-DT-317 and one 4-DC-645 Buda Diesel Engine. New engines at 25% off factory list. R. A. Young & Son, Inc., Fort Smith, Arkansas.

FOR SALE

12—230 H.P. Type 10 Bessemer New 17″ Power Cylinders complete ready to run with 16″ to 18″ Compressors. 1—230 H.P. Clark Horizontal with Compressors. Located Salem, Illinois.

ENGLE PETROLEUM, Incorporated
Box 655, Evansville, Indiana

STEEL STORAGE TANKS

Railroad Tank Car Tanks, 6,500 to 12,000-Gal. Cap. Coiled and Non-Coiled.

Cleaned—Painted—Tested
Heavier—Safer—Cheaper
Other Tanks, Too.

Also — Complete Tank Cars 8,000 and 10,000-Gal. Cap.

Your Inquiries Solicited

NEWHALL-MARSHALL-WOOD, INC.
30 Church Street New York 7, N. Y.
Phone: COrtlandt 7-8060

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

New Wire Rope at Money-Saving Values: Leading brands. Sizes ¼″ to 1⅛″, 6x19, 6x37, construction for all purposes. Degen Pipe & Supply Company, Box 107, Red Fork Station, Tulsa, Oklahoma.

FOR SALE: Two Fairbanks-Morse Diesel Engines, 150 H.P. Twin Cylinder, Horizontal Type. Completely overhauled. $1500.00 each. Melton Supply Co., Seminole, Okla.

1 FRANK'S well servicing unit mounted on International truck, also 1 Allis-Chalmers E 60 well servicing unit mounted on tandem International truck. Both units equipped with double legged 62-ft. telescope mast. Complete rods & tubing tools. Shafer Well Servicing, 1219 S. Mekusukey, Wewoka, Oklahoma.

FOR SALE: Approximately 15,000′ of 6⅝″ O.D. Plain end Line Pipe, in 40 ft. sections. Excellent condition. H. L. Smith, St. Elmo, Illinois, Phone 115.

FOR SALE: Failing 3600 well drilling machine mounted on 1946 Dodge 1½ ton truck. Drilled less than 1500 ft. 150 ft. drillstem, 4 Hughes rock bits, 4 fishtail bits, mud bucket, complete for well drilling. Must be seen to appreciate price. W. W. Howell, Calera, Alabama.

FOR SALE: Moore 65 ft. truck mounted type well servicing derrick. Box D-314, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 3 New 10,000 bbl. A.P.I. Columbian Bolted Steel Tanks. 160—8000 & 10,000 Gal. Tank Cars. Darien Corp., 60 E. 42nd St., N. Y., N. Y.

Several Army Surplus 4½″ x 6″ Gaso Duplex 1860 Pumps — two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

H. H. COFFIELD
ATTN: W. H. Orr
Phones: 132—Rockdale, Texas
A-86064—Houston, Texas

NEW PIPE FOR SALE

(Subject to Prior Sale)

5000 Ft. 9⅝″, 36#, J55, Range 2, 8 Rd. Thrd. Seamless Casing
4000 Ft. 8⅝″, 28# Ditto
19,000 Ft. 6″ Std. Byars L.W. W.I. Pipe

Specification ASTM-AF2-33

Contact

National Cooperative Refinery Assn.
Phone 820 McPherson, Kansas

EQUIPMENT FOR SALE

ROLAGRIP COUPLINGS—For Sale, 100 tons, 1½″ to 8″ inclusive. New, never used, complete with bolts and neoprene gaskets. Price 50% less than manufacturers selling price. Send for list. JULIUS M. FOGELMAN, Reading, Pa.

FOR SALE—NEW PIPE
420 Ft. 12″ Std. 49.56# ⅜″ wall. 340 Ft. 8″ extra strong 43.38# ½″ wall. New seamless plain end pipe, low price. Exner-Dodge, Inc., Coffeyville, Kansas.

FOR SALE—10 miles 10¾″ OD 40.5# lapweld pipe. This good used line pipe is racked and ready for immediate delivery. Located in Oklahoma. Bethlehem Supply Company, Box 2171, Tulsa 2, Oklahoma.

FOR SALE

New 150,000 bbl., A.P.I. welded type cone deck tanks complete. 150′ dia. x 48′ high. Available immediate delivery Atlantic Coast Port.
1—New 4x6 Wheatley Oil Shipping Pump complete with electric motor drive.

R. H. TECKLENBORG CO.
811 W. 7th Street, Los Angeles 14, Calif.

FOR SALE

Two 1440 HP GM 16-278A Diesel Engines and two GM 3-268A Diesel Engines—Westinghouse 100 KW AC Generator Sets. Complete with all Aux. Equip. Practically new. Inspect. Make offer. Box D-284, The Oil and Gas Journal, Tulsa, Oklahoma.

BARGAIN

Two **new** Model 6NKU-6NK-20-S "Waukesha" Oilfield Power Units. Latest type—7″ x 8½″, 225 h.p., equipped with Twin Disc power takeoff, gas pressure gauge, safety magneto, 1 CKU starting unit, radiator cooled. Can be used with butane, natural gas, or gasoline.

Cost $6799 each; will sell for $5835 each, f.ob. Cut Bank, Montana.

Central Machinery Co.
Your "Caterpillar" Distributor
Great Falls, Montana

FOR SALE

5—10¾″ Butler Slip Type Casing Elevators w/ 1 Set Slips	$150.00 ea.
1—Set 5½″, 6⅝″, 7″, 8⅝″, 9⅝″ or 10¾″ Slips for above Elevator	$50.00 set
1—20″ Regular Casing Spider w/ 1—Set 20″ Slips	$200.00
3—13⅝″ Cameron S D A Blow Out Preventers w/ 4½″ Rams	$750.00 ea.
1—13⅝″ Cameron S D A Blow-out Preventer w/ Blank Rams	$750.00 ea.

Above prices quoted FOB Shreveport, La.

Phone 3-0871 — P.O. Box 1242
Shreveport, La.

7,000′ CAPACITY ROTARY RIG

Wilson "Giant" Drawworks Serial 6464, powered by Two 8-cylinder LeRoi Engines; 123′ Moorco Portable Mast with 4′-6″ Substructure; B-14 Emsco Pump; SS-250 Ideco Swivel; Regan Traveling Block; 27½″ Oil Well Rotary; 100 B-J Triplex Hook; 6,500′ Excellent 4½″ Drill Pipe. This rig is a splendid value. See it at our Oklahoma City yard.

LUCEY PRODUCTS CORPORATION
624 S. Cheyenne TULSA, OKLA. Phone: LD 204

EQUIPMENT FOR SALE

GENERATORS for diesel driven electric power, 125 KVA, 240/280 volt, 3 phase, 60 cycle, 900 RPM, complete with exciters and control cabinets, connections for parallel operation of two or more generators, brand new, manufactured by Electric Machinery Manufacturing Company, $2000.00 each, seven available Northern Ordnance, Incorporated, Minneapolis, Minnesota.

50,000′ of 3½″ OD 14 Gauge plain end, 20-24 ft. joints J & L 800# test pressure tubing immediate delivery. Dale W. Moore, 504 City Natl. Bk. Bldg., Houston, Texas.

FOR SALE

4,500′ 32# 8⅝″ O.D., S.S. Casing, 8-V-Thread

25,000′ 11# 4½″ O.D., Line Pipe, P.E. or T. & C.

30,000′ 5.8# 2⅞″ O.D., Line Pipe, P.E.
All the above No. 1 Grade

BANKOFF PIPE & SUPPLY COMPANY

823 No. Lewis — Tulsa, Oklahoma

EQUIPMENT WANTED

WANTED: Double-drum well servicing unit with mast, suitable for truck mounting. Must be satisfactory for work up to 3500′. Nation Oil Company, Fairfield, Illinois.

WANTED: MODEL R Cardwell with mast, two or three drums. Gas Engine preferred. Suitable for cable tool drilling. Box D-299, The Oil and Gas Journal, Tulsa, Oklahoma.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street, N.W., Washington 5, D. C.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908. Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing. Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

EQUIPMENT FOR SALE

WATCH THIS SPACE FOR OUTSTANDING WEEKLY VALUES

TOWERS & VESSELS

All API-ASME Code

4—3′x12′x7/16″ thick shell and heads, 260 = w.p.
1—5′6″x13′x3/4″ thick shell and heads, 275 = w.p.
1—5′x13′x3/4″ thick shell and heads, 305 = w.p.
4—4′6″x20′x7/16″ thick shell and heads, 150 = w.p.
2—36″x8′ wl 14″ skirt, 275 = w.p.
1—3′6″x72′x7/16″x9/16″ shell x 7/16″ top head x 9/16″ bottom head, 25 tray absorber, 160 = w.p. @ 150°F, mounted on 10′4″ skirt.
1—6′x68′x1/2″ thick shell and head, 30 tray stripper, 150 = w.p. @ 500°F, radiographed, mounted on 14′6″ skirt.
1—5′6″x70′x1″ thick shell and heads, 30 trays depropanizer, 350 = w.p. @ 300°F, stress relieved and radiographed, mounted on 5′ skirt.
1—3′6″x16′x3/8″ thick shell and heads, reflux accumulator.
1—7′x30′x9/16″ thick shell and heads, 170 = w.p.
1—5′x16′x15/16″ thick shell and heads, 400 = w.p.
1—7′x30′x5/8″ thick shell and heads, 180 = w.p.
1—5′x16′x1/2″ thick shell and heads, 150 = w.p. stress relieved and radiographed.
3—24″x4′x1/4″ thick shell and heads, 50 = w.p.
1—20x″4′11/8′x3/8″ thick shell and heads, 200 = w.p. @ 150°F.
1—3′x6′x3/8″ thick shell and heads, 125 = w.p. @ 150°F, stress relieved.
1—5′x16′x13′/16″ thick shell and heads, 250 = w.p. @ 200°F.
1—5′6″x50′x7/8″ thick shell and heads, 20 tray 88 rerun column, 250 = w.p. @ 300°F, stress relieved and radiographed.
3—6′10″x21′6″x7/8″ thick shell and heads, Stratco contactors wi inner shell 5′3⅜″x15′7″x1/2″ thick shell and heads and G-R tube bundle 1½″ steel pipe and 3′37″ OD G. fins, shells stress relieved.
1—12′x66′x3/4″ thick shell and heads, 29 tray stripper column, 100 = w.p. @ 200°F, stress relieved and radiographed, mounted on 9′4″ skirt.
2—12′6″x85′5″x1″ thick shell x 3/8″ thick heads, 40 tray extractor columns, 150 = w.p. @ 300°F, radiographed only, mounted on 14′7″ skirt.
2—12′x22′x15/16″ thick shell and heads, 150 = w.p. @ 200°F, radiographed.
1—3′x7′x1/4″ thick shell and heads, 50 = w.p. @ 300°F.
2—6′x38′x7/8″ thick shell and heads, 250 = w.p. @ 300°F, stress relieved and radiographed.
1—7′x60′x9/16″ thick shell and heads, 25 tray concentrator, 150 = w.p. @ 450°F, mounted on 5′11″ skirt.
1—3′x5′x5/16″ thick shell and heads, 50 = w.p. @ 350°F.
1—7′x30′x9/16″ thick shell and heads, 150 = w.p. @ 200°F, stress relieved and radiographed.
1—3′6″x16′x5/16″ thick shell and heads, 50 = w.p. @ 200°F.
1—4′6″x16′x3/8″ thick shell and heads, 110 = w.p. @ 150°F.
1—8′x20′x3/8″ thick shell and heads, 50 = w.p. @ 180°F.
1—6′x4′10″x7/16″ thick shell and heads.
1—6′x13′x5/16″ thick shell and bottom, open top.
2—36″x8′, 275 = w.p. air receivers, National Board stamped, mounted on 14″ skirt.
1—3′x6′x3/8″ thick shell and heads, 125 = w.p. @ 150°F, stress relieved, mounted on 2′9″ dia x 6″ high skirt.
4—3′x12′3″x3/8″ thick shell x 7/16″ thick heads, 180 = w.p. @ 650°F, stress relieved and radiographed.
1—10′x25′x11/16″ thick shell and heads, 100 P.S.I. vacuum 15″ @ 250°F, stress relieved and radiographed.
1—6′x8′x1/4″ thick shell and heads.
1—4′6″x10′x1/4″ thick shell and heads, 50 = w.p. @ 150°F.
1—3′6″x30′x1/2″ thick shell and heads, 10 tray regeneration column, 175 = w.p. @ 450°F, stress relieved and radiographed, mounted on 4′9″ skirt.
1—3′6″x30′x1″ thick shell and heads, 6 side pans, regeneration column, 250 = w.p. @ 450°F, stress relieved and radiographed, mounted on a 4′9″ skirt.
1—12′x33′x1-1/16″ thick shell and heads, 155 = w.p. @ 200°F, stress relieved and radiographed.
1—4′x16′x9/16″ thick shell and heads, 175 = w.p. @ 150°F, stress relieved.
1—3′6″x6′x3/8″ thick shell and heads.
1—11′x45′x1/8″ thick shell and heads, 180 = w.p., stress relieved and radiographed.
2—8′x3′ scrubber, 50 = w.p.
1—24″x5′x1/4″ thick shell and heads, 50 = w.p.
1—3′6″x5′x1/4″ thick shell and heads, 35 = w.p.
1—3′6″x15′x5/16″ thick shell and heads, 100 = w.p. @ 200°F.
1—15½″x58″x1/2″ thick shell x ½″ flgd. head x ½″ conical bottom.
1—4′x26′x5/16″ thick shell and heads, 35 = w.p. @ 150°F, mounted on 8′ skirt.
1—7′x40′x3/8″ thick shell and heads, 50 = w.p. @ 150°F.
2—2′6″x15′x3/8″ thick shell and heads, 150 = w.p. @ 450°F.
1—3′x25′x3/8″ thick shell and heads, 175 = w.p. @ 200°F, mounted on 3′ skirt.
1—4′x16′x1/2″ thick shell and heads, 175 = w.p. @ 200°F.
1—4′6″x16′x1/2″ thick shell and heads, 150 = w.p. @ 200°F.
1—4′6″x50′x3/8″ thick shell and heads, 20 tray rerun column, 50 = w.p. @ 450°F, mounted on 10′ skirt.
1—6′x15′x5/16″ thick shell and heads.

DULIEN STEEL PRODUCTS, INC.
of Washington
P. O. BOX 667
COTTON VALLEY, LA.
PHONE: COTTON VALLEY 26

HELP WANTED

PIPELINE operator for Mid West gathering system 3500 b-d. Must be experienced and aggressive. Box D-290, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS, Executives, Technical Men Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection, will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 1204 Berger Bldg., Pittsburgh 19, Pa.

WANTED: Graduate Petroleum Engineer for work in Mexico. Minimum five years' experience in completion and production of flowing wells. Knowledge of Spanish desirable. Salary open, depending on experience. Box D-305, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Refinery superintendent for 5,000 barrels per day refinery. Skimming with Dubbs Cracking, Polymer Unit. Location, Kansas. In reply, please give complete information: personal, education, experience, references, and salary expected. Box D-311, The Oil and Gas Journal, Tulsa, Oklahoma.

REPRESENTATIVE WANTED by nationally known manufacturer to sell metallic packing, piston rings, and valves to compressor plants and gas pipeline stations in West Texas-New Mexico territory on commission basis. State qualifications first letter. Box D-312, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Civil Engineer capable of registering in any Southern State including Florida. Experience on Natural Gas Distribution Systems preferred. Address: Littrell Engin. & Constr. Co., Inc., Moultrie, Georgia.

GAS ENGINEER. Opening for gas engineer with at least five years general experience in natural gas business. Work in distribution and utilization phases of business particularly important. Age, under 35. Location, Northwest, and position will involve some travel. Box D-289, The Oil and Gas Journal, Tulsa, Oklahoma.

SALESMAN wanted by major supply company to solicit refineries, gasoline and chemical plants in Texas Gulf Coast area. Must have experience in direct selling of refinery equipment; maintenance materials. Must be under 40 years of age. Excellent future. Box D-300, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED seismologist for work in division office. Must be capable of highest type seismic interpretative work. Permanent position. Good future. Give full details of education, experience, age, and availability in first letter. All replies held confidential. Address Sun Oil Company, attention L. G. Ellis, Box 2831, Beaumont, Texas.

GEOPHYSICIST

Caracas, Venezuela

Senior man familiar with interpretations of seismic and gravity data and capable of independent review work. Minimum 5 years' commercial experience. Apply by letter stating education, experience and salary requirement to—

The Atlantic Refining Co.
RM. 900, 260 S. BROAD ST.
PHILADELPHIA 1, PA.

PARTY CHIEFS

Two thoroughly experienced and capable Party Chiefs wanted by aggressive, moderate-sized geophysical company for work in Canada. Applicants will be judged primarily on skill and experience in the interpretive field. Wonderful opportunity for right men, but the right men must be good. Excellent salary.

If interested, give full and complete particulars in first letter, including education, experience, age, family status and recommendations. Replies will be held strictly confidential. This ad positively known to our employes.

BOX D-306
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

HELP WANTED

AGENTS WANTED: Armstrong Internal Condenser Tube Cutters. Owing to our recent expansion program, we have a few openings for reliable agents. Apply listing lines now handled and territory covered. Armstrong & Sons, Ridgefield, N. J.

WANTED: Experienced gas gathering system and gas measurement man, immediate employment, for gasoline plant location in central Texas. Write giving experience, age, family, present employer, and salary expected. All replies strictly confidential and all of our employes have been notified of this advertisement. Box D-286, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW foreign and domestic Oil Employment Directory. Over 500 listings in drilling, production, refining, natural gasoline plants, pipe lines, geological, exploration, supply manufacturers, services; and trucking, refinery and pipe line contractors, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (Our 28th year).

SITUATIONS WANTED

ROTARY DRILLING Superintendent now employed desires to change to West Texas or Mid-Continent area. Family of four, sober, dependable, investigation invited, references. Box D-273, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 131, Ph. No. 131, Hobbs, New Mexico.

CORROSION ENGINEER: Sixteen years' experience in corrosion and secondary recovery. Prefer to locate in Mid-Continent or Texas area. Box D-292, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION Superintendent, graduate petroleum engineer, 36, experienced all phases drilling, completion, production. Desire responsible connection with active organization. Excellent references. Box D-295, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer: 4 years experience in drilling, production, and reservoir engineering. Want work with Major or Independent preferably in Mid-Continent Area but will go anywhere. 27 years old and single. Excellent recommendations. Box D-310, The Oil and Gas Journal, Tulsa, Okla.

GEOLOGIST, B.S., 3½ yrs. subsurface experience in Cuba and Venezuela, desires a position with aggressive company, preferably domestic. Box D-308, The Oil and Gas Journal, Tulsa, Oklahoma.

INSTRUMENT ENGINEER—Thirteen years supervisory, engineering, and maintenance experience in petroleum refinery and chemical plants. Box D-307, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER with sixteen years varied experience. Engineering and plant production supervision in petroleum and chemical fields. Practical and conscientious. Desires responsible position with future. Box D-313, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS manager, contact man. Fourteen years in drilling industry. Age 36. Box D-305, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRES CHANGE: Refining and Production Material Man. Experienced in Auditing, Inventory, Control, Purchasing and Sales. Can furnish the best of references. Age 35. Box D-302, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER. B. S., 2½ years Refinery and Gasoline Plant Design, 4 years Glitsch Tray Design. Married, Age 28. Available January 1. Box D-298, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE'S SECRETARY, college man of 28. Outstanding ability and qualifications. Experience in Legal, land and geological dictation. Assumes responsibility. Use stenotype and Gregg shorthand. Will travel. Box D-297, The Oil and Gas Journal, Tulsa, Oklahoma.

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PRODUCT SALES: Latin American and domestic experience. Trained to develop industrial-aviation - automotive markets through knowledge of lubrication engineering and combustion plus superior sales ability. Thirteen years prominent oil equipment, transportation companies. Young, 35. Proven ability to organize, progressive ideas with profitable results. Box D-301, The Oil and Gas Journal, Tulsa, Oklahoma.

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OFFICE OR DESK space rental in new uptown Tulsa building. Telephone and stenographic service provided. Mr. McGilvray, 257 West 12th, Apt. 4, Tulsa 14, Oklahoma.

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INTERESTED in a small to medium water flooding proposition in Kansas or Oklahoma. Box D-285, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND for oil lease, 2,000 acres. Part Agua Dulce tract. Five miles north Harlingen, Texas. Oil producing around this area. Write Edward Gee, 2600 West 79th, Chicago, Illinois.

WANTED TO BUY: Settled Oil Production located in Illinois, Indiana, or Western Kentucky. Do not offer property unless it will stand rigid inspection. We are independent producers and will treat offerings with confidence. Box D-265, The Oil and Gas Journal, Tulsa, Oklahoma.

EXTRA well located Great San Juan Basin, New Mexico, 11,000 acres, ten year leases 25c acre rentals. One lease $2.50 acre, small oil payment. Opportunity, lifetime. Box D-304, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT an oil well, or several, or an interest in one? Can furnish 40 to 80 acre lease FREE, 1/6 royalty to land owner, for drilling 4,500 foot well, contract price $40,000 finished on pipe line, proven land, heart of 38° paraffin base oil pool. Better wire for particulars. E. L. Stratton, Pecos, Texas.

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DEEDED ROYALTIES

San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington, New Mexico.

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Lubrication Symposium Now Available in Printed Form

A symposium on lubrication of high-speed turbine gear equipment which was presented at a meeting of Technical Committee C, American Society for Testing Materials, Committee D-2 on Petroleum Products and Lubricants, in Washington last February, is now available in printed form.

Termed "Technical Publication No. 92," the symposium was arranged by a special committee consisting of F. C. Linn, chairman, General Electric Co.; C. D. Wilson, Allis-Chalmers Manufacturing Co.; F. E. Rosenstiehl, The Texas Co.; and D. F. Wilcock, General Electric Co.

The symposium includes four papers and an introduction, the latter by Linn, pointing out that the proper lubrication of turbine-driven gears and worm gears which are used in turbines is of vital importance to the refiner, the manufacturer, and the customer. Copies can be obtained from A.S.T.M. headquarters, 1916 Race Street, Philadelphia, at 75 cents each.

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CALENDAR OF EVENTS

December

Annual joint meeting of Texas sections of American Institute of Mining and Metallurgical Engineers, Texas A. & M. College, College Station, Tex., December 8-9.

American Chemical Society, southwest regional meeting, Oklahoma City, December 8-10.

National Society of Professional Engineers, annual meeting, Houston, December 8-10.

Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex., December 9.

January

Kansas Independent Oil and Gas Association, annual meeting, Wichita, January 16.

February

American Institute of Chemical Engineers, regional meeting, Houston, February 26-March 1.

American Society for Testing Materials, spring meeting, Hotel William Penn, Pittsburgh, February 27-March 3.

Southern Gas Association, meter and regulator conference, Houston, February 9-10.

March

American Petroleum Institute, Division of Production, Southwestern District meeting, Adolphus Hotel, Dallas, March 8-10.

Indiana Independent Petroleum Association, spring convention, Hotel Severin, Indianapolis, March 9-10.

Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, March 27-29.

American Petroleum Institute, Division of Production, Mid-Continent district meeting, Skirvin Hotel, Oklahoma City, March 29-31.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas Nomads, first Monday of each month, Texas Room, Baker Hotel.

Houston Nomads, second Monday of each month. Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

FPC Reserves Decision on Atlantic Gulf's Request

Federal Power Commission has reserved decision on Atlantic Gulf Gas Co.'s request for oral argument on its motion to dismiss the application of Southern Natural Gas Co., and also reserved decision on the former firm's motion to dismiss the intervention of Southern Natural in the proceeding involving Atlantic Gulf's application.

Both companies are proposing to construct natural-gas-transmission facilities designed to serve substantially the same areas of Georgia, Florida, South Carolina, and Alabama. Consolidated hearings on the applications were scheduled to begin December 6 in Washington, D. C.

Atlantic Gulf also has asked FPC to defer the hearing pending its requested oral argument and determination of the motion to dismiss. The commission denied this request.

In its order, FPC found that "it is in the public interest to reserve decision on Atlantic Gulf's (motions) . . . until all evidence has been presented in these consolidated proceedings."

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that the lands listed herein are offered through sealed bids on the terms hereinafter specified, to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the lands under sec. 17 of the Leasing Act of February 25, 1920 (41 Stat. 437; 30 U.S.C. sec. 181), as amended. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D.C., on or before 1 p.m. of the date set out herein. Each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank or by money order made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease required under 43 CFR 192.42 (a) (2) and (a) (3), Circular 1730. The envelopes should be plainly marked that they are not to be opened before the date and hour set out herein, and should show the number of the parcel and the name of the field. No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental must be paid and an acceptable surety bond in the sum of at least double the amount of rental, but in no case less than $1,000 nor more than $5,000, must be furnished by a successful bidder prior to the issuance of a lease. An acceptable $5,000 surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 1860, Title 18, U. S. Code, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Royalties payable to the United States will be at the rate of $12\frac{1}{2}$ per cent to 25 per cent for oil, and $12\frac{1}{2}$ per cent to $16\frac{2}{3}$ per cent for gas, in accordance with Schedule B in the lease form. Annual rental will be at the rate of $1.00 per acre. The lands are on the known geologic structure of the Caddo field, Louisiana, and are offered in the following parcels: T. 19 N., R. 16 W., La. Mer., Parcel No. 1, sec. 4, $S\frac{1}{2}NE\frac{1}{4}$, 79.45 acres. Parcel No. 2, sec. 6, lot 1, 7.40 acres. T. 20 N., R. 16 W., La. Mer., Parcel No. 3, all fractional sec. 20, 37.83 acres. Parcel No. 4, sec. 32, lots 1 and 3, 91.56 acres. Total 216.24 acres. Bids must be submitted on or before 1 p.m., December 28, 1949, and must be submitted on each parcel separately, but no objection will be made to the award of more than one parcel to the same successful bidder. Marion Clawson, Director.

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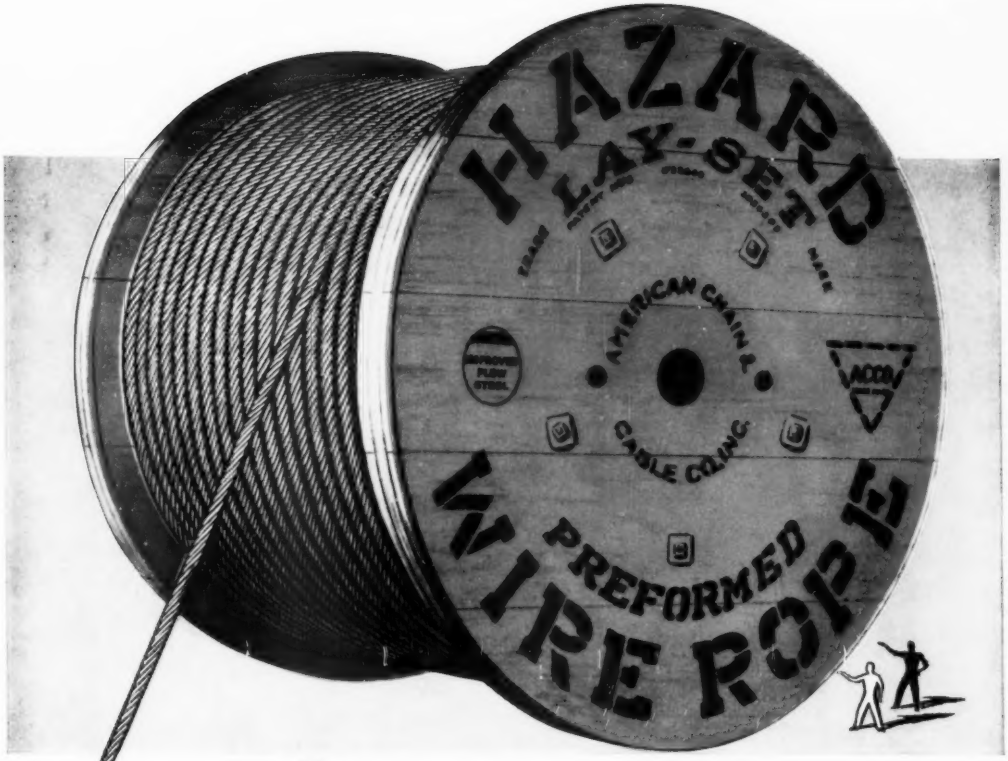

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